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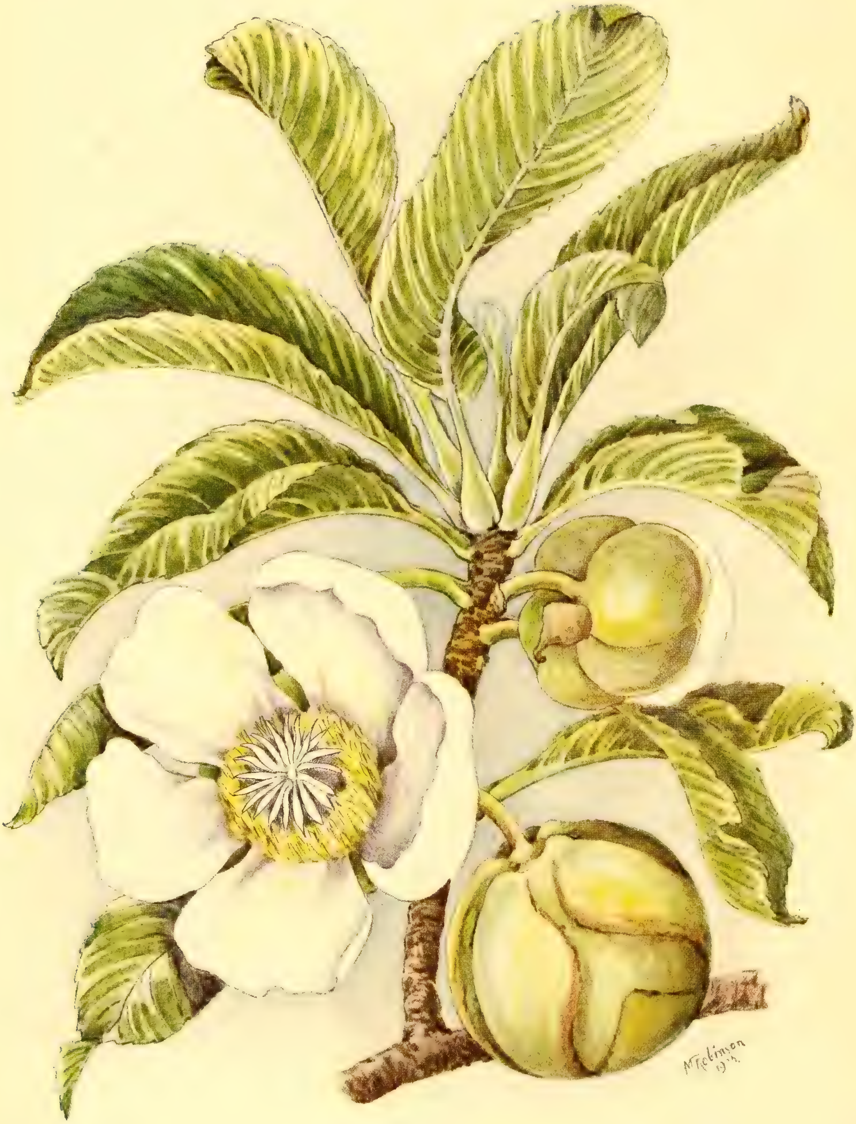

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THE LARGE FLOWERED DILLENIA.
Dillenia indica, Linn.
(about 1/3 nat. size)

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April, 1936. Vol. XXXVIII. No. 3.

SOME BEAUTIFUL INDIAN TREES.

BY

The late E. Blatter, s.j., ph.d., f.l.s.,

and W. S. Millard, f.z.s.

Part XX.

(*With two coloured plates and one black-and-white plate*).

(*Continued from page* 231 *of volume* xxxviii).

The Large-flowered Dillenia.

Popular Names: *Chalta* (Hind., Beng.); *Mota karmal* (Mar.); *Karambali Thabyu* (Burm.).

Dillenia indica Linn. Sp. Pl. (1753), p. 535, (Syn. *D. speciosa* Thunb.). Belongs to the family *Dilleniaceae*. *Dillenia* in honour of J. J. Dillenius (1684-1747), botanist and professor at Oxford, and author of important botanical works; *indica* after its habitat—India.

Description: An erect evergreen tree, which in favourable localities grows to a height of 30 or 40 ft. Its spreading branches form a dense rounded crown of handsome bright green foliage. The bark is smooth, red and moderately thick. It peals off in small hard scales. The leaves grow at the ends of the branches. The leaf-stalk is channelled, bout 1-2 in. long, its base partially encircling the supporting branch. An average leaf is 8-12 in. long and 4 in. in breadth. It is oblong lance-shaped with a finely pointed apex and sharply toothed margins. The close-set nerves running in regular parallel lines to the marginal teeth give the leaves a beautiful deeply fluted surface. The upper part of the leaf and the nerves beneath are covered with fine hairs. The large fragrant white flowers appear singly at the ends of the branches. They may exceed 6 in. in diameter. The club-shaped stalk of the flower is

3 in. long, round and smooth. The calyx is composed of five fleshy rounded and concave sepals, which persist and form the outer covering of the fruit. The five large petals are oblong and heavily crinkled. The numerous stamens form a yellow crown round the white spreading rays of the stigma. The fruit is large and hard. With the sepals which surround it—it measures from 3-4 in. across. Internally it is fleshy and its many flat seeds are embedded in a glutinous pulp.

Flowers: The flowers appear in June and July.

Distribution: Moist and evergreen forests of the eastern sub-Himalayan tract, Assam, Burma and the Indian peninsula. Chiefly found along the banks of tropical forest streams and rivers and other damp places, on deep rich moist soil.

Uses: Planted as an ornamental tree. The thick sepals have an agreeable acid flavour and are eaten by the natives. When added to syrup they are used as a cough mixture (Dalzell and Gibson).

Gardening: *Dillenia* is readily propagated from seed but with difficulty from cuttings (Bailey). The tree reproduces satisfactorily from coppice-shoots, as in the Holongapar coppice coupes, Assam (Troup). Growth is moderately fast.

The fruits are buoyant in water, and those which drop into the streams from the trees along their banks are carried down until stranded. Wild elephants eat the fruits, and are probably agents in the spread of the seed. Under ordinary conditions, however, the seed has no means of escaping from the fruit owing to the rigid covering of the thickened sepals, and Nature's method of overcoming the difficulty is interesting. The fruit on reaching the ground quickly turns brown, decays and, in the hot season, shrivels into dry masses. White ants eat out the interior and fill the dry shell with earth. The seeds, however, remain untouched, and at the commencement of the rains they germinate in the earth accumulated by the white ants, and the seedlings burst through the many cracks and joints of the dried shell (see Troup, vol. i, p. 2).

THE KLEINHOVIA.

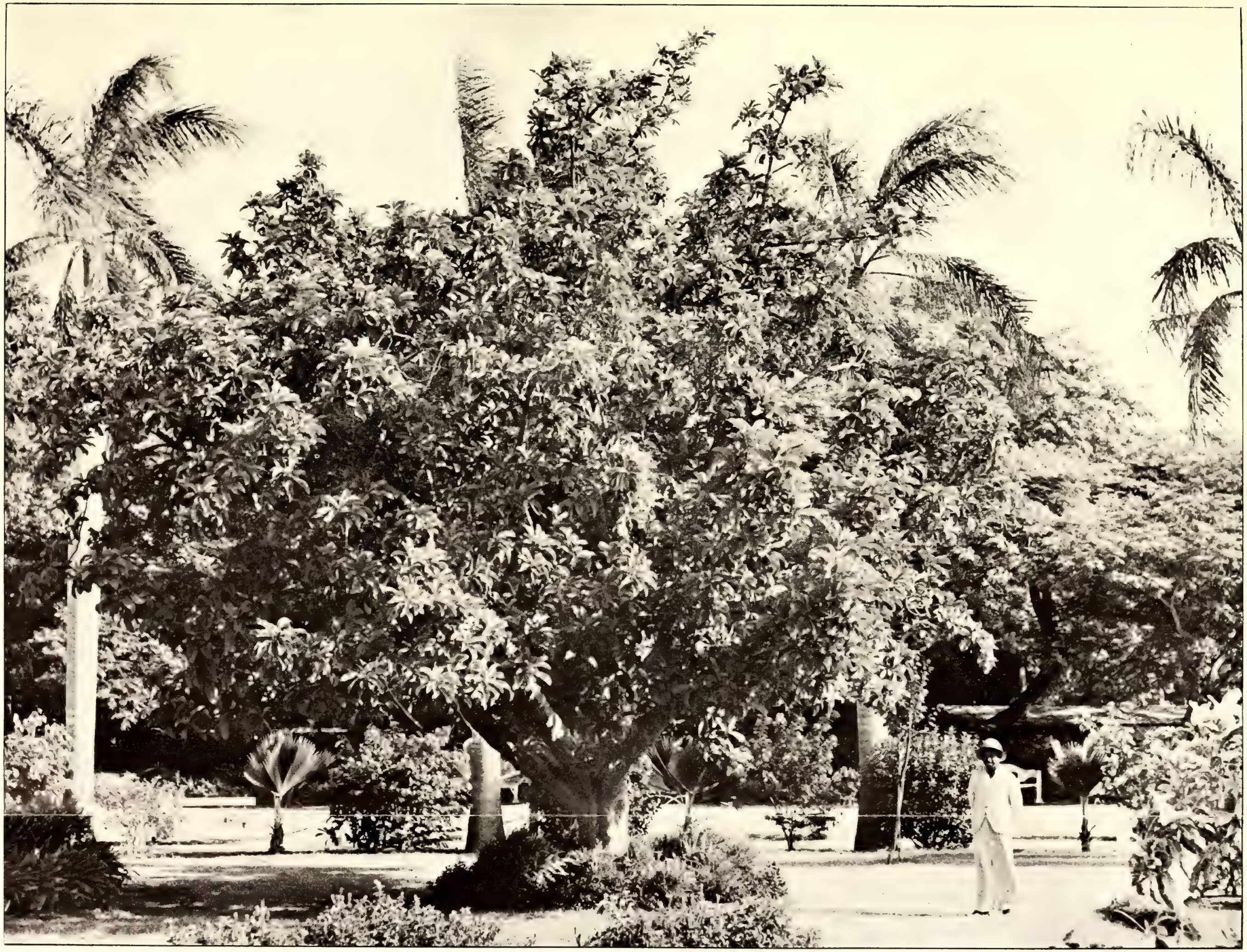
Popular Names: (None known).

Kleinhovia Hospita Linn. Belongs to the order *Sterculiaceae*.

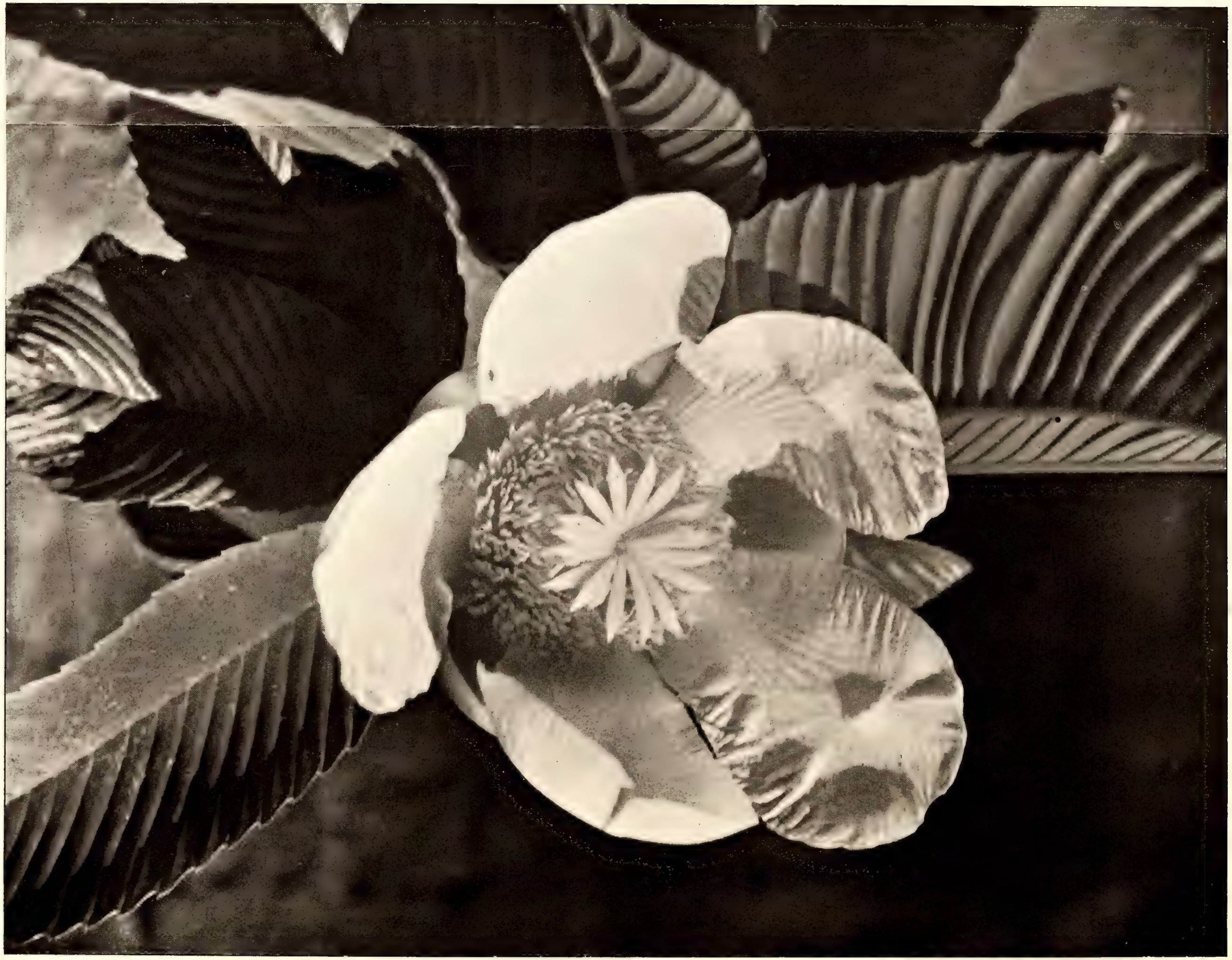
The species was described first in Linnaeus' *Specie Plantarum*, Ed. 2, as 'Kleinhof horti Bot. cultor in Java'. Nairne (*Flowering Plants of Western India*) says: 'A doubtful native (D) but pretty widely distributed in India (H.)'.

In regard to the derivation of the name *Kleinhovia*, by the courtesy of Mr. C. A. Backer of Heemstede, formerly botanist at Buitenzorg, we quote the following:

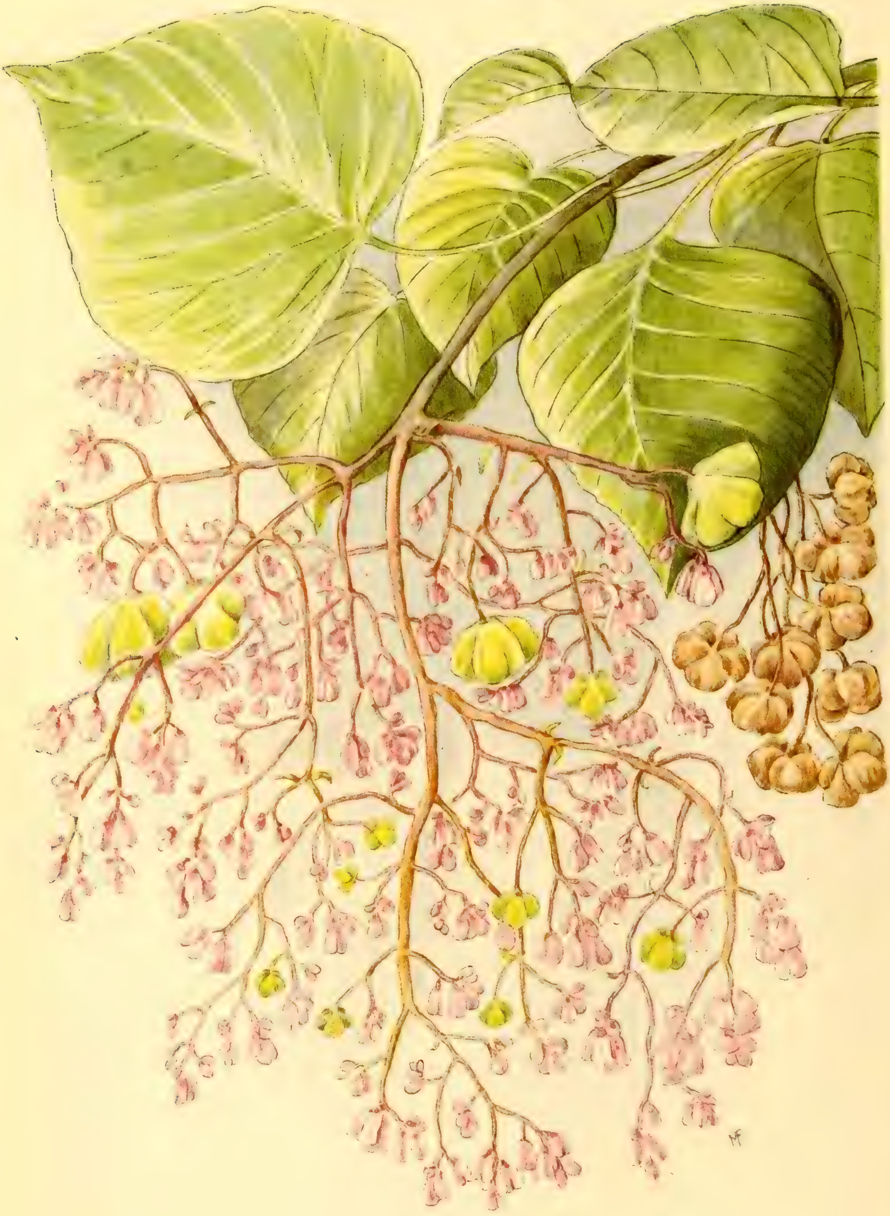
'Linnaeus' correspondent was Christian Kleynhoff, born (year unknown) at Sandau in Upper Silesia, who was a Government physician for three years in West India and for twenty-one years in East India and from 1741 or 1742, a civil officer of the V.O.I.C. (United East India Company). He had a garden at Batavia in which many native and Chinese medicinal plants were



Tree of *Dillenia indica* in the People's Park, Madras. August 8th, 1935.



Flower of *Dillenia indica*, from a tree in the People's Park, Madras. July, 1935.



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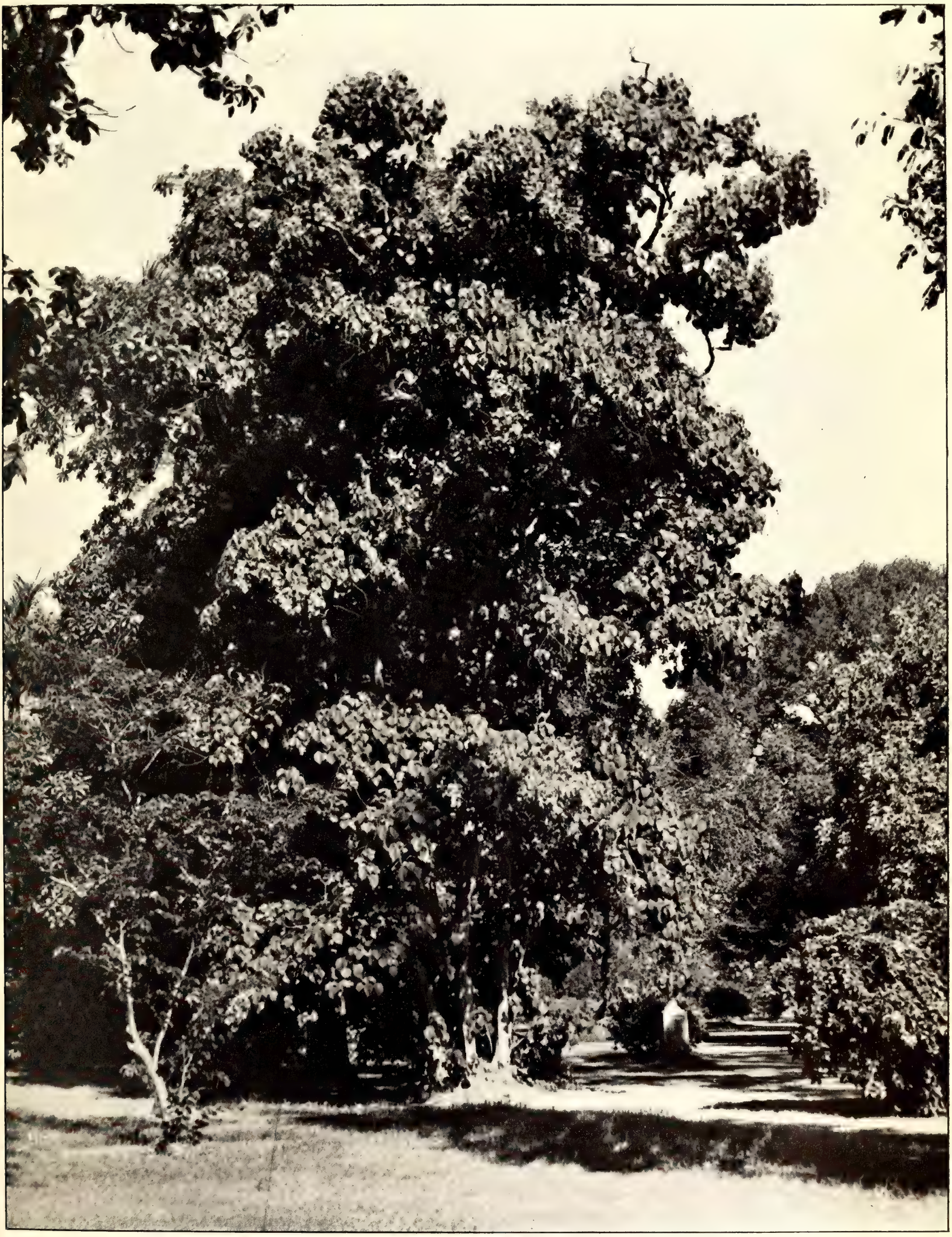
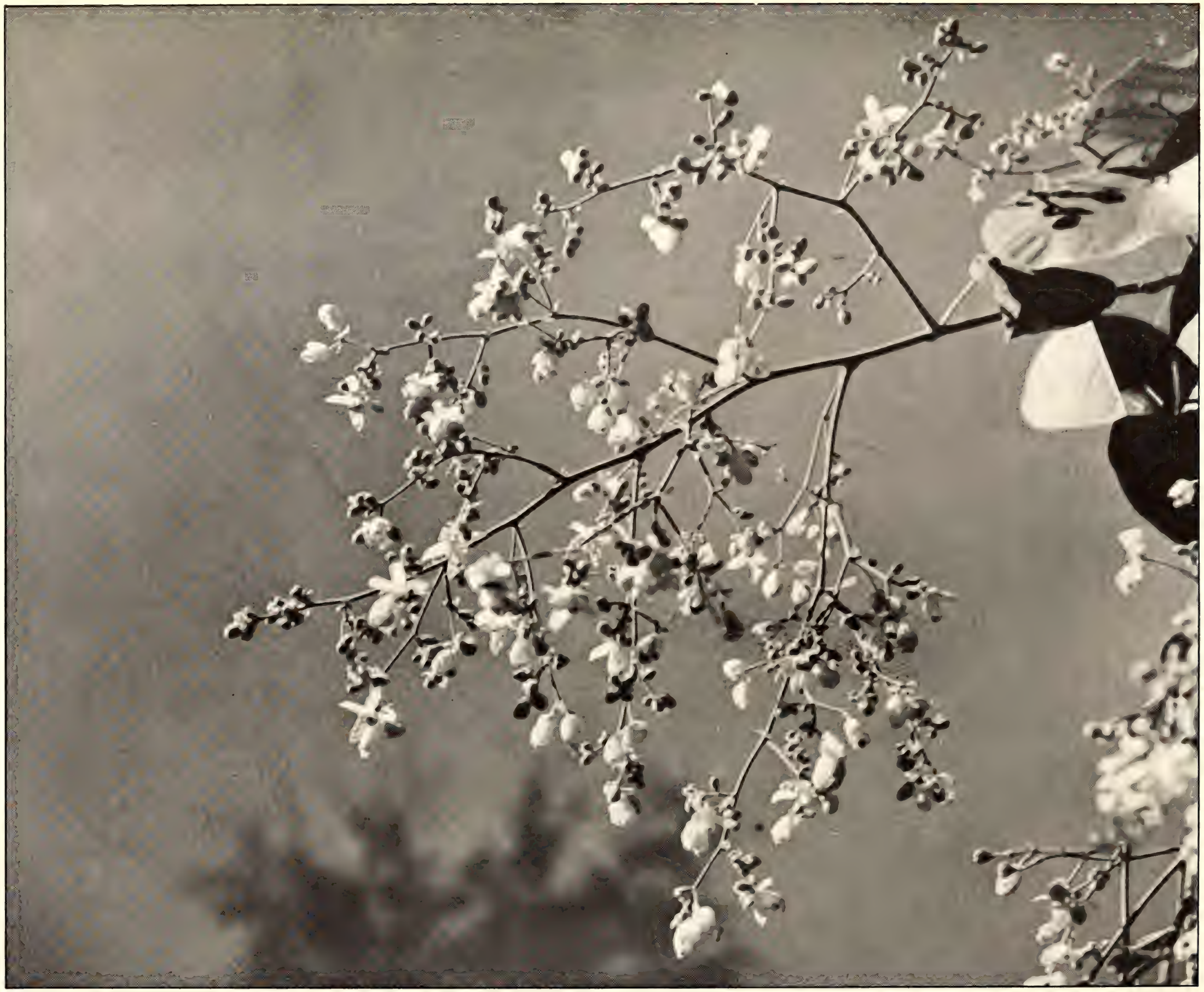
The Kleinhovia Tree.
Kleinhovia Hospita, Linn.
(about ½ nat. size)



Tree of *Kleinhovia Hospita* in the Agri-Horticultural Society's Gardens, Madras.



Flowers of *Kleinhovia Hospita*. The Agri-Horticultural Society's Gardens, Madras. September 21st, 1935.

grown. He returned to Holland in 1763 and died at Culemborg, Holland, in 1777.'

Mr. Wm. T. Stearn, Librarian, Lindley Library, Royal Horticultural Society, London, has kindly supplied the following note on the specific name *Hospita*:

'*Hospita* is the feminine of *hospes*—a visitor, guest or stranger. Burmann's account of Kleynhoff's generosity in distributing plants and seeds suggests that the specific name (*Hospita*) refers not to a property of the plant *Kleinhovia* itself but to the hospitable Kleynhoff himself. The capital H for *Hospita* is I presume used by Linnaeus because *Hospita* is here a noun in apposition, not an adjective in agreement, in the same way as Linnaeus adopted a capital letter for generic or vernacular names used as a specific epithet, e.g. *Epidendrum Vanilla*, *Schinus Molle*, etc.'

Description: This is a moderately-sized tree with large leaves and showy panicles of delicate rose pink flowers. The leaf is oval, often with a heart-shaped base. Its nerves 3-7 in number grow out fan-wise from the base. The small flowers grow in large many-branched clusters. The fine sepals of the flower fall off early leaving only the pink unequal petals, the uppermost of which has a long claw-shaped apex. The stamens unite to form a slender column, which widens into a cup, bearing in each of its five divisions three 2-celled antlers. The ovary is 5-celled and lobed and lies in the cup formed by the stamens. The style is slender, the stigma divided into five parts. The fruit is a membraneous, inflated capsule. The seeds are marked with small tubercles.

Flowering season: July to August.

Distribution: The tree is indigenous to the delta of the Mekong River. It is common on the shores of the Malay Archipelago and grows inland in Tropical East Africa and Australia. It was introduced into Ceylon about 1820 and is now fairly established in cultivation in Western India.

Gardening: A beautiful tree particularly when in bloom and really worthy of cultivation. It is propagated by layers: seeds being rarely procurable.

THE VERNAY SCIENTIFIC SURVEY OF THE EASTERN GHATS.

(Ornithological Section).

BY

Hugh Whistler, M.B.O.U., assisted by N. B. Kinnear, M.B.O.U.

Part XIII.

(*Continued from page 240 of this volume*).

Falco peregrinus calidus Latham.

Falco calidus Latham, Index. Ornith., vol. i (1790), p. 41—India.

The Peregrine Falcon is, according to Jerdon, abundant all along the east coast of India, and less so perhaps along the western coast, and this agrees with the information which I received from my Punjabi falconers in the days when I kept my own trained falcons. There is, however, very little accurate information on the point. Jerdon goes on to say that he found it near Trichinopoly and at Calicut and Tellicherry and that many used to be captured at Ramnad. He also tells us that great numbers were captured yearly in the Northern Circars. Colonel Sparrow's collection contains an adult male killed on the Colair Lake on 2 February 1913.

Hume states (*S.F.*, x, 333), that the Peregrine had been killed near Sultan's Battery in the Wynaad, and William Davison says that he identified a pair on the wing at close quarters near Ootacamund on 24 January.

Ferguson says that his collectors secured a single specimen on the backwaters of North Travancore in December 1903 and saw a second bird near the backwater at Quilon.

This completes the published records and the only Presidency specimens in the British Museum are three old skins marked 'Madras' from Jerdon, Wardlaw-Ramsay and the Hume Collection. The Peregrine was not reported by the Survey and for lack of proper specimens I have not investigated the correctness of the subspecific name, which is merely accepted from the *New Fauna*. The bird is of course a winter visitor or passage migrant only.

Falco peregrinus peregrinator Sundevall.

Falco peregrinator Sundevall, Physiogr. Sallst. Tidsskr. Lund, vol. i (1837), p. 177, pl. 4—near Nicobars.

The Shahin was not reported by the Survey, but Jerdon states that it occurs in certain localities in the Carnatic and is known to breed in various parts of the Eastern Ghats. There are specimens in the British Museum obtained at Madras in March 1877 (Hume Coll.) and November (C.L.O. Buck), and Dewar says that one was shot by Mr. D. G. Hatchell in his compound.

On the west, Betts considers it an occasional wanderer into Coorg. William Davison says that it is rare on the Nilgiris and their slopes but that he had noted it occasionally, the last occasion being between Neddivattum and Gudalur. Betts informs me that a pair may nearly always be seen (and presumably breed on) the Gudalur malai, a crag which rises above the Gudalur ghat road.

Kinloch presumably refers to this form when he says that the Peregrine is common on the Nelliampathies, breeding on the precipices of the northern slopes.

In Travancore I find only Jerdon's statement that he had shot it in the state and Ferguson's that one was shot by a Mr. Walch in Trivandrum in November 1893 and presented to the Museum.

The Shahin is doubtless resident in the Presidency but the breeding season is not recorded.

Falco jugger Gray.

Falco jugger Gray in Hardwicke's Illustr. Ind. Zool., vol. ii (April 1834), p. 26—India.

There are only two records of the Lugger Falcon in the Madras Presidency. A bird collected at Pulicat in the Chingleput district is in the Madras Museum, while a male collected by Darling on 5 January 1878 in the Wynaad is in the British Museum.

Falco severus rufipedoides Hodgson.

Falco rufipedoides Anonymous = Hodgson, Calcutta Journal Nat. Hist., vol. iv (1844), p. 283—Hills of India, restricted to Nepal by Stuart Baker, *Bull. B.O.C.*, xlvii (1927), p. 107.

Not met by the Survey. The Indian Hobby is only known to occur in the south-western corner of the Presidency and there is very little accurate information about its status there.

Its occurrence in the Nilgiris is still a matter of doubt. William Davison was under the impression (*S.F.*, x, 333) that he had noticed a pair frequenting the Ibis rocks near Pykara, and Primrose (*J.B.N.H.S.*, xvi, 166) says that though he never met with the bird personally in the Nilgiris he was told that it bred in the Gunjara precipices.

Kinloch considered it not uncommon in the Nelliampathies. In Travancore its occurrence is at least authenticated by three specimens in the British Museum. These are a male with no precise data collected by Bourdillon, a male collected at Kowdiar, South Travancore, on 27 April 1874 (Bourdillon) and a male shot on 14 February 1914 at Aneichardi by Stewart. F. W. Bourdillon thought for some reason (*S.F.*, iv, 354) that the Indian Hobby might breed in Travancore but Ferguson was probably on surer ground in considering it a winter visitor, to be seen on the hills and occasionally in the low country.

In the account of this race in the *New Fauna* (v, 47) the western limit of the distribution is given as Kumaon (misspelt Kuman) in spite of the statement in the next paragraph that Mackinnon took a nest at Murree and others round Mussoorie. This species certainly occurs as far west as Mussoorie for there is a specimen from that place in the Hume Collection. I doubt however whether it breeds at Murree and think that there must be some mistake over the nest supposed to have been obtained there by Mackinnon. In *Nidification* (vol. iv, p. 34) the western limit is extended to Kashmir where it is said probably to breed fairly commonly, but at present the evidence for its occurrence at all in Kashmir is unsatisfactory.

[**Falco chicquera chicquera** Daudin.

Falco chicquera Daudin, Traité d' Orn., vol. ii (1800), p. 121—Bengal, Chandernagar.

Dewar includes the Red-headed Merlin in his Madras list, but as he makes no comment on the fact and there is no other record for the Presidency I think it is wiser not to admit the species to the Presidency list until further evidence is forthcoming.]

Erythopus amurensis (Radde).

Falco vespertinus var. *amurensis* Radde, Reis. Ost. Siberien, vol. ii (1863), p. 102—Blagowestschensk, Amoor, E. Siberia.

The Eastern Red-legged Falcon is only a rare straggler to the Presidency and there is very little detailed information about it. Jerdon states (*B. of I.*, i, 41) that he had killed it in the Nilgiris and the Carnatic and had seen another at Nellore and the former specimen is perhaps the one which Hume refers to in *Stray Feathers* (ii, 529) as being in the Calcutta Museum. Dewar includes it in his Madras list, possibly also on Jerdon's authority. There is however, an adult male in the British Museum killed in 1871 at Nursipatam near Rajahmundry and the label states that it was obtained by a collector from the Madras Museum.

Falco tinnunculus objurgatus (Stuart Baker).

Cerchneis tinnunculus objurgatus Stuart Baker, *Bull. B.O.C.*, vol. xlvii (1927), p. 106—Nilgiris.

Specimens collected:—245 ♀ 17-5-29 Shevaroys 5,400 ft.

Measurements:—

Bill.	Wing.	Tail	Tarsus.
23	234	Worn.	39 mm.

There is in Southern India—and the fact has been well known from the time of Hume—a small dark resident race of Kestrel which is very largely a mountain bird. Its distribution is not yet fully worked out, but it probably breeds here and there throughout the Western Ghats as James Davidson (*apud* Barnes, *J.B.N.H.S.*, iii, 211) says that a fair number breed all along the ghats in the Nasik district where he shot a young bird unable to fly in May. This specimen from Septashring is in the British Museum and undoubtedly agrees with Nilgiri specimens.

In the Presidency it is recorded from the Wynaad where William Davison shot one (♀ juv.: wings and tail not fully grown: in the Hume Collection) near Karote at the foot of the Brahmagherries, and saw two others on those hills. It is common on the Nilgiris and their slopes, frequenting the more open and cultivated tracts and the downs and breeding on the more inaccessible crags. It occurs commonly in the Nelliampathies and Palnis, more particularly at higher elevations in the latter, and also apparently through the Travancore ranges.

On the eastern side our information is meagre, but the specimen obtained by the Survey in the Shevaroys suggests that it also has some distribution in the Eastern Gahts.

The *New Fauna* (v, p. 65) says that this race is also resident in Ceylon. I have seen no evidence to that effect. Legge clearly considered the Kestrel to be a winter visitor to the island and none of the specimens in the British Museum belong to this race. Wait did not meet with it.

Hume states that the laying season in the Nilgiris is in the last week of February, in March and in April.

The identification of the Survey Kestrels made it necessary for me to go into the general question of what races occur in India as the arrangement of the group in the *New Fauna* is most manifestly unsatisfactory. The *New Fauna* (vol. v, 61-5) admits 5 races in the Indian Empire as follows:—*tinnunculus* as a winter visitor; *interstinctus* breeding throughout the Lower Himalayas from 2,000 ft. to 8,000 ft. and also in the Assam area, wintering in Northern India; *saturatus* breeding in Burma and only a local migrant; *japonicus* (*japanensis*) breeding in Ladakh and Northern Kashmir and wintering in the Peninsula; and finally *objurgatus* resident in Southern India. The distinctions given between these forms are nebulous and have resulted in very curiously mixed identifications in different collections.

The first point to establish in this enquiry is the identity of the breeding birds of our area and here we are immediately up against the fact that breeding specimens are strangely lacking for identification. I have been through the whole of the Indian Empire series in the British Museum and, apart from specimens of the race *objurgatus*, can only find 4 breeding birds, all from the Western Himalayas. There are no specimens from Assam or Burma in the British Museum, which from their dates are likely to be breeding birds, and Dr. Ticehurst tells me that he has found no definite evidence that any Kestrel breeds in Burma at all. No specimens of probable breeding birds are included in the large collections that he has received from Burma. Luckily I can supply the deficiency in one particular. My own collection contains a good series of birds from Ladakh, Kashmir and the western Himalayas which are known to be breeding birds, in many cases shot for the identification of eggs. This series first of all establishes the fact that there is no difference between the breeding birds of Ladakh, Kashmir or the outer Himalayas down to 2,500 ft.

The series has been most carefully compared with a good series of European birds. In size there is no difference at all.

European birds measure as follows:—

		Wing.	Tail.		Wing.	Tail.
Witherby (*Handbook*, p. 122)	15 ♂	230-252	150-173:	♀	235-265	— mm.
Ticehurst (*Ibis*, 1923, p. 262)	20 ♂	234-251	160-180:	18 ♀	244-261	162-185 mm.
H. W. Collection	12 ♂	236-256	147-165:	4 ♀	252-258	169-177 mm.

This range of variation is very wide and it amply covers the range of measurement in Himalayan breeding birds as follows:—

	Wing.	Tail.
13 ♂	232-250	154-170 mm.
8 ♀	243-264	166-183 mm.

Mr. Stuart Baker (*Bull. B.O.C.*, xlvii, p. 103) in his preliminary discussion says that the few Western Himalayan specimens killed in the breeding season are *all darkish birds* if compared with European specimens. My series, and with this verdict Dr. Ticehurst agrees after a careful comparison of them with European birds, are quite indistinguishable from European birds. They have the same wide variation in colour and markings. The only difference we can find is that some males are *paler* than any European birds we possess, but the percentage of such pale birds is not sufficient to warrant the separation of a Himalayan race. I am therefore satisfied that West Himalayan birds belong to the typical form. The identity of the breeding race (if any) in the Eastern Himalayas, Assam and Burma, remains to be established.

It has long been known that the breeding race of Southern India is separable on size and colour. It is slightly smaller as follows:—

	Wing.	Tail.
10 ♂	221-242	147-158 mm.
12 ♀	234-258	145-173 mm.

The adult male differs from the typical race in the deeper, more foxy, brick-red of the upper parts, lacking the faint wash or bloom characteristic of *tinnunculus*. The top of the head is a duller, darker grey, or even streaked rufous-brown as in the female. The grey tail is apparently always faintly barred. The underparts are well tinged with rufous and the markings on the central flanks are somewhat different in character. The female is a richer brick-red in colour, with heavy barring and the underparts also differ as in the male.

It remains to establish the identity of *Falco interstinctus* McClelland, *P.Z.S.* 1839 (March 1840), p. 154—Assam and *Tinnunculus saturatus* Blyth, *J.A.S.B.*, xxviii (1859), p. 277—Ye, Tenasserim (not Port Blair, Andamans as given in the *New Fauna*, vii, 403), in case either of these should prove to be the same bird as *objurgatus*, which is antedated by both.

Falco interstinctus of McClelland is based on descriptions in Latin and English which are merely generalised descriptions of the immature or female Kestrel and not recognisable as any particular race. Horsfield, however, goes on to explain that the real difference from the typical form is apparently that the male and female are alike in plumage and confirms this with a quotation to the same effect from Sykes. It will therefore be seen that the original describers made no claim to this form being darker, and this arose later from an examination of the supposed McClelland type in the British Museum, which has no exact data but is of the immature type of plumage, a rather dark bird with broad heavy bars. Taken alone it might be considered one of the darker phases of *tinnunculus tinnunculus*, to which all the other Assamese specimens in the British Museum belong in my opinion except a second McClelland specimen which is of a foxy red type.

Tinnunculus saturatus of Blyth from Tenasserim is, on the other hand, definitely said to be a heavily barred bird. There is no reason to suppose that any Kestrel breeds in Tenasserim and all Burmese birds that I have seen belong either to the typical race or to a heavily barred form which is evidently the bird that Blyth received. With these latter the type of *interstinctus* agrees.

These heavily barred birds I am unable to separate from the Japanese and N. Chinese form *Falco tinnunculus japanensis* Ticehurst (vide *Bull. B.O.C.*, vol. i, p. 10 new name for *F. t. japonicus* Temm. and Schlegel) and I have no doubt that they are winter visitors to the Eastern Himalayas, Assam, Burma, Eastern and Southern India and Ceylon from all of which localities I have seen specimens. This race has a bright foxy phase which is not found in the typical race and to it the second McClelland specimen evidently belongs. Of the three names *interstinctus* is the earliest and will therefore take precedence. *Objurgatus* is easily separated from *interstinctus* in most cases—no one can expect to name all specimens of Kestrels correctly, the species is so variable and the races so difficult to discriminate—by the smaller size, by the richer brick-red colour and the absence of bloom on the back and mantle of the adult male, and by the richly coloured underparts, *interstinctus* having the undersurface as in the typical form, from which indeed many specimens are not separable.

Falco tinnunculus tinnunculus Linnaeus.

Falco tinnunculus Linnaeus, Syst. Nat., ed. x, vol. i (1758), p. 90—Sweden, Europe.

Specimens collected: 1083 ♀ 11-12-29, 1133 [♂] 17-12-29 Cumbum Valley, Kurnool.

Measurements:—

	Bill.	Wing.	Tail.	Tarsus.
1 ♂	21.5	231	161	36.5 mm.
1 ♀	22.5	249	159	38 mm.

The typical race of the Common Kestrel certainly occurs as a passage migrant or as a winter visitor in the Madras Presidency, and probably in some numbers, as Major Bates tells me that Kestrels are very common in the plains of the Carnatic in the winter, being about as late as April. In addition to the two Survey birds there are specimens in the British Museum as follows:—♂ 4-1-1869 Salem (Theobald), ♀ 22-1-1881 Ootacamund (William Davison) and ♂ imm. Travancore (Fry). Most of the specimens I have examined from Ceylon also belong to this race.

Falco tinnunculus interstinctus McClelland.

Falco interstinctus McClelland, P.Z.S. 1839 (March 1840), p. 154—Assam.

This race also occurs in the Presidency as a winter visitor for there are the following specimens in the British Museum:—♂ immature 15 January, ♀ 19 December 1868 Pothanore, Coimbatore (Carter), ♀ no date Travancore (Fry).

[**Falco naumanni pekinensis** Swinhoe.

Falco cenchris var. *pekinensis* Swinhoe, P.Z.S. 1870, p. 442—Ming tombs near Pekin.

The Lesser Kestrel is included in Inglis and Baker's *Birds of Southern India*, p. 236, with reference to Jerdon's statement that he found it breeding on the cliffs of the Nilgiris in May and June; but the authors are of course right in discrediting this record. Hume (*Scrapbook*, p. 105) gives the measurements of an adult female said to have been shot near Coonoor by Mr. Carter of Coimbatore. As however the specimen is not in the Hume Collection and it does not appear that Hume ever saw it himself, while the measurements do not rule out the possibility of the specimen being a Common Kestrel, I am not prepared to accept the record.]

[**Aquila nipalensis** Hodgson.

Aquila nipalensis Hodgson, Asiat. Res., vol. xviii, pt. 2 (1833), p. 13, pl. 1 (named on plate only)—Valley of Nepal.

In the *Old Fauna* the southern limit to which the Steppe Eagle penetrates in India in winter was given as Khandesh, Seoni and Raipur, but in the *New Fauna* (v, p. 71) it is said to occur as far south as North Travancore on the authority of Mr. Stewart. As eagles are notoriously difficult to identify and it does not appear that a specimen was preserved for comparison with authentic examples I have some hesitation in accepting this bird on the Presidency list, the extension of range being so great and the country so unsuited to its requirements.]

Aquila rapax vindhiana Franklin.

Aquila vindhiana Franklin, P.Z.S. 1930-31 (October 25, 1931), p. 114—Vindhya Hills.

Jerdon states that the Tawny Eagle is unknown on the Malabar Coast and rather rare in the Carnatic and the only actual records I find for the Presidency are from the latter area. There is a specimen—Dr. Gravely is kind enough to tell me—in the Madras Museum from Poonamallee. Major R. S. P. Bates informs me that he found a nest at St. Thomas' Mount on 31st May. It then contained a single feathered chick which had become a 'brancher' by the end of June.

[**Aquila clanga** Pallas.

Aquila clanga Pallas, Zoogr. Russo-Asiat., vol. i (1811-1827), p. 351—Russia.

Jerdon states that the Greater Spotted Eagle is tolerably common in the Carnatic and the Malabar Coast but I have traced no more definite record to justify its inclusion in the Presidency list.]

Aquila pomarina hastata (Lesson).

Morphnus hastatus Lesson in Bélanger's Voy. Indes Orient. (1834), p. 217—Bengal.

The *New Fauna* (v, 76) states that the Small Indian Spotted Eagle is 'uncommon in Travancore and Madras' but the only authority that I can find for its inclusion in the Presidency list is a female collected at Kotagiri on 15 February now in the Hume Collection in the British Museum.

Hieraaëtus fasciatus (Vieillot).

Aquila fasciata Vieillot, Mém. Linn. Soc. Paris, vol. ii (2), 1822, p. 152—Montpellier, France.

Bonelli's Eagle was not procured by the Survey. It does, however, occur on the eastern side of the Presidency as Jerdon obtained the specimen figured in his Illustrations in the Guindy Park at Madras, and this is doubtless the authority on which Dewar included the bird in his list.

On the western side it is recorded from the Nilgiris and Travancore. In the former hills it is not uncommon according to William Davison and he had also seen it in the plains country at the base of the hills. Bonelli's Eagle is not included in Ferguson's Travancore list but Stuart Baker (*Nidification*, iv, 54) says that Stewart took many nests.

The breeding season appears to be about December in which month Miss Cockburn obtained eggs at Kotagherry (*Nests and Eggs*, vol. iii, 143).

A specimen from 'Madras' (Jerdon) in the British Museum is probably the above from Guindy Park. There appears to be no other Presidency specimen available for examination to verify the statement that South Indian birds belong to the typical race.

Hieraaëtus pennatus (Gmelin).

Falco pennatus Gmelin, Syst. Nat., vol. i, pt. i (1788), p. 272—Hungary.

The Booted Eagle was not procured by the Survey but it appears to be a fairly common winter visitor to the Presidency, keeping apparently to the plains and lower hills. On the western side we have a specimen from Coorg (Wardlaw-Ramsay) in the British Museum, while Hume states (*S.F.*, x, 335) that it is not uncommon in the Wynaad, whence he had received a pair many years previously. A male from Cannanore (17-10-1882 Wardlaw-Ramsay) and an unsexed bird from Calicut (1873 Hume Collection) are in the British Museum, as well as one 'Anjango' and two 'Madras' specimens. Ferguson states that the Trivandrum Museum possessed only one local specimen killed in February.

On the eastern side Dewar's inclusion of the Booted Eagle in his Madras list is doubtless based on the local specimen in the Madras Museum. A male from Pothanur, Salem district, collected by Theobald on 9 December 1868 is in the British Museum. Jerdon mentions a specimen procured by Mr. Hooper C. S. at Trichinopoly (*Madras Jour. Lit. Sci.,* 1839, p. 75).

Hume (*Scrapbook*, p. 186) described a nest with 2 eggs taken by his collector Mr. Theobald on 21 February 1869 at Hurroor, Salem district, from which the parents, both in the brown plumage, are said to have been shot. This record has been copied from book to book and is included in Mr. Stuart Baker's *Nidification* (vol. iv, p. 56). In my opinion it is quite untrustworthy and I am of opinion that the nest was that of the Common Pariah Kite. The description of the egg is unlike that of the Booted Eagle and agrees with that of the Kite; the breeding of this migratory eagle in Southern India is quite unlikely; and finally Theobald was a most unreliable collector [vide his account of the breeding of Montagu's Harrier in a tree in the same district (*Scrapbook*, p. 305) and of the Long-legged Buzzard in the Salt Range (*loc. cit.,* p. 277)]. The Booted Eagle frequently flies with Kites (cf. Bruce Amer. Nat., vi, 1872, p. 460) and I myself in my early collecting days in India procured my first specimen of the brown phase of the Booted Eagle when I was shooting kites as food for a captive Lämmergaier. No doubt Theobald shot his birds near the nest, not *from* it.

Lophotriorchis kienerii (Sparre).

Astur kienerii Sparre, Mag. Zool. Ois. (1835), pl. 35—Himalayas.

According to the *New Fauna* (v, 81) the Rufous-bellied Hawk-Eagle is found in the 'south-west coast of India from Southern Bombay Presidency to Ceylon' but I can find no record from further north than the Wynaad from where Primrose believed that he had secured a specimen (*J.B.N.H.S.,* xvi, 164). The identity of this specimen appears never to have been confirmed and its present whereabouts is not known. With this exception I cannot trace it further north than the Anamallai Hills where Kinloch found a nest with a young bird in December 1906 (*J.B.N.H.S.*, xvii, 1027). In Travancore it is a resident species but not common. Bourdillon obtained a specimen at 2,000 ft. and thought that he had seen another alive (*S.F.,* vii, 33) and Ferguson shot one at the foot of the hills in South Travancore in April 1901. A supposed specimen of the egg taken on 16 February 1906 is described by T. F. Bourdillon in the *Journal* (xviii, p. 499).

In *Nidification* (iv, 57) Mr. Stuart Baker gives us very complete information of the status of this fine eagle in Travancore on the authority of Mr. Stewart. It is said to breed at all heights from 1,000 to 4,000 ft., but principally between 1,500 and 3,000 ft. while the egg has been taken from 27 November to the end of March.

On the eastern side of the Presidency the bird is not known to occur.

There appears to be no specimen of the Rufous-bellied Hawk-Eagle from the Presidency available for examination unless a female dated 26-10-1876 in the British Museum from the 'Great Valley' is possibly Bourdillon's original specimen. I have not therefore been able to verify the identity of these south-west birds with the Himalayan race.

Ictinaëtus malayensis perniger (Hodgson).

Aquila perniger Hodgson, J.A.S.B., vol. v (1836), p. 227—Nepal.

The Black Eagle is well known on the western side of the Presidency where it must be very generally distributed through the hill jungles. Jerdon states that he saw it in Coorg and Mr. Betts has recorded that he saw one there for about a week in November 1928. Jerdon also saw it in the Wynaad and a nest taken there early in January is recorded by Daly (*J.B.N.H.S.,* xii, 589).

All observers agree that it is not uncommon on the Nilgiris and their slopes, though avoiding the actual plateau and it is also common on the Nelliampathies (Kinloch). In the Palnis Fairbank observed it at three different places about 4,000 ft.

In Travancore Bourdillon and Ferguson considered it a fairly common resident from 500 ft. upwards. Stewart is said to have taken eggs in Travancore between 1,000 and 4,000 ft., the breeding season being apparently from November to February, though one egg was taken on 9th September (*Nidification,* iv, 61). There are 5 specimens in the British Museum from Kotagiri (Cockburn) and Mynall (Bourdillon).

Jerdon tells us that he also saw the Black Eagle on the Eastern Ghats and Mr. LaPersonne reports that he saw a fine specimen on the Shevaroy Hills.

As no specimens were procured by the Survey I have not checked the identification of South Indian birds.

Nisaetus cirrhatus cirrhatus (Gmelin).

Falco cirrhatus Gmelin, Syst. Nat., vol. i, pt. i (1788), p. 274—India.

Specimens collected:—310 ♂ 2-6-29 Chitteri Hills 2,000 ft.; 643 ♀ 3-8-29, 713 ♀ 19-8-29 Palkonda Hills 1,000 ft.

Measurements:—

	Bill.	Wing.	Tail.	Tarsus.
1 ♂	41	398	278	100.5 mm.
2 ♀	45-46	424-434	284-288	102-102.5 mm.

The Crested Hawk-Eagle is found on both sides of the Presidency. On the eastern side there is a record from Chatrapur, Ganjam (where a Captain Pritchard shot a specimen on 7 March 1904). As the bird had been particularly noticed about since the preceding November and the same gentleman was said to have killed one previously in 1895 it is obvious that the species was not considered common in this area (C. E. C. Fischer, *J.B.N.H.S.,* xv, 716).

Jerdon states that he obtained this eagle in the Eastern Ghats and doubtless some of the six specimens marked 'Madras' in the British Museum came from the Eastern Ghats, but the three Survey specimens supply the only other precise records from this side. Mr. LaPersonne remarks regarding them that many were observed in the forest round Ballepalle and that in the Chitteri range its call might be heard daily.

On the west both Hume (*S.F.*, x, 336) and Primrose (*J.B.N.H.S.,* xvi, 165) state that the Crested Hawk Eagle occurs in the Wynaad and the Nilgiris and a male collected by William Davison on 28-4-1876 at Seegore is in the British Museum. Kinloch says that it is very common in the Nelliampathies.

There appears to be no record of the breeding season in the Presidency.

With reference to the note on the identity of the 'Devil-bird' given *ante* (p. 233) it may be remarked that Dr. Spittel in Ceylon was convinced (for reasons given in full *J.B.N.H.S.,* xxx, 914) that this eagle is the author of the nocturnal cries. Mr. LaPersonne is of the same opinion after his visit to the Chitteri range.

Nisaetus cirrhatus ceylanensis (Gmelin).

Falco ceylanensis Gmelin, Syst. Nat., vol. i, pt. i (1788), p. 275—Ceylon.

This race of the Crested Hawk-Eagle is stated by Mr. Stuart Baker (*New Fauna,* v, 86 and *Nidification,* iv, 64) on the authority of Mr. Stewart to be very numerous in the south of Travancore. It is said to breed from the foothills upto about 2,500 ft.; and eggs are usually laid in January and February, though Stewart has taken them from early December to the end of March.

The only specimen which I have examined is an 'Anjango' bird in the British Museum which is the type of Hume's *Spizaëtus sphynx* (*S.F.,* i, 319).

Nisaetus nipalensis kelaarti Legge.

Spizaëtus kelaarti Legge, Ibis 1878, p. 202—Ceylon.

This race of Hodgson's Hawk-Eagle is confined to the western side of the Presidency. Hume received an adult specimen from the Nilgiris (*S.F.,* iv,

446) which was given him in June 1872 by Mr. F. L. Chapman of Ootacamund (*S.F.*, x, 336) though the racial identification was never confirmed. Mr. Betts informs me that he shot one in his bungalow compound 4 miles from Nedivattam.

In Travancore, according to Ferguson it is rare and confined to the hills. Three specimens obtained by Bourdillon at Mynall (♂ 18-12-76, ♀ 9-7-78, ♀ juv. not dated) are in the British Museum. Stuart Baker states on the authority of Stewart that the bird breeds between 1,000 ft. and 4,000 ft. (*Fauna*, v, 91; given as 3,000 ft. in *Nidification*, iv, 68) and that the breeding season lasts from early December to the end of March, most eggs being laid in January.

Circaetus ferox (Gmelin). Olim *Circaetus gallicus* (Gmelin).

Accipiter ferox S. G. Gmelin, Nov. Comm. Acad. Petrop., xv (1771), p. 442, pl. x—Astrakan, S. Russia.

The only record of the Short-toed Eagle which I can trace for the Presidency is the statement by Stuart Baker (*Nidification*, iv, 69) that Stewart took two or three nests in Travancore.

For the change of name from the time-honoured *Circaetus gallicus* (Gmel.) see Grant, *Ibis* 1934, p. 644.

Haematornis cheela melanotis (Jerdon).

Buteo melanotis Jerdon, Madras Jour. Lit. Sci., vol. xiii (1844), p. 166—at the foot of the Nilgiris.

The status of the Crested Serpent Eagle on the eastern side of the Presidency appears to be quite unknown. Jerdon met it at Goomsoor. Dewar includes it in his Madras list without any comment and I have a note that it breeds at Yercaud but cannot trace the authority for either statement. On the west it is well known. In Coorg, according to Betts, it is common though not numerous, and William Davison and Primrose (*J.B.N.H.S.*, xvi, 165) both state that it is not uncommon in the Wynaad.

In the Nilgiris according to Davison it does not occur on the higher hills and is uncommon on the slopes, becoming more numerous at the foot of the hills. Kinloch calls it common in the Nelliampathies but in the Palnis Fairbank only saw a single pair.

In Travancore Ferguson says that it is fairly common in the low country and also on the hills. This statement is expanded by Stuart Baker on the authority of Stewart. He considers that there are two races in the country, of which the larger called *H. c. minor* is very common in the plains and foothills, and the smaller, considered identical with the Ceylon bird *spilogaster*, is found in some numbers between 500 ft. and the highest hills, but most commonly between 500 and 2,000 ft. The breeding season of the larger bird is given as December to March and of the smaller as January to March (*Nidification*, iv, 72-75). To anyone who knows this eagle in life this altitudinal difference of races cannot seem satisfactory. The chief characteristic of the bird is its propensity for soaring very high in the sky, so it is hard to believe that birds which must meet daily in their common playground the air can segregate into two races, one breeding from sea level up to 500 ft., the other above the 500-foot contour. The evidence on the point also can hardly be very strong as in the *New Fauna* Mr. Stuart Baker, again on the authority of Stewart, states (vol. v, p. 99) that *minor* breeds in the plains and on page 101 that it is confined to the higher and drier ranges where the forest is almost deciduous, while on the latter page *spilogaster* is said to be resident in the wetter evergreen forests at the lowest elevations and sea levels. A similar confusion over the breeding ranges of *H. c. cheela* and *H. c. minor* occurs in *Nidification*, vol. iv, pp. 71 and 73, the breeding bird of Nadia being attributed to each in turn.

The explanation is, I think, that sufficient allowance has not been made for the fact that the Crested Hawk-Eagle—like many other birds-of-prey—is a species with a good deal of individual variation, both in colour, amount of spotting and barring, the colour of the undertail coverts and size. The grease staining on the lower parts of many skins in the British Museum has also been mistaken for true colouration.

The situation as regards India and Ceylon appears to me to be as follows. The typical race breeds along the Himalayan foothills and the neighbouring forest areas as far westwards as Kangra and Gurdaspur, visiting also the Indo-Gangetic Plain in winter. This race has the chin and throat blackish, the breast somewhat barred and the tail-bar almost pure white. It is also very large:—

	Bill.	Wing.	Tail.
3 adult ♂ Punjab foothills	42-50	472-479	296-305 mm.
2 adult ♀ Punjab foothills	47.5-48	482-484	299-304 mm.

Birds from the Peninsula southwards to Travancore and also from Ceylon all appear to me to be similar in colouration, except for individual variation. The chin and throat do not usually become black, the breast is generally uniform and the tail bands are grey, not white. They show a steady diminution of size from north to south, obscured no doubt again by individual variation, and most marked in Ceylon. On size alone I would, therefore, separate the Cinghalese bird *H. c. spilogaster*:—

	Bill.	Wing.	Tail.
4 adult ♂ Ceylon	41-44	370-389	222-240 mm.
3 adult ♀ Ceylon	42-44	384-398	240-250 mm.

I have not been able to trace the specimens collected by Stewart and have only been able to examine 4 males from Travancore. These measure:—bill, 43-46; wing, 387-434; tail, 244-279; which is clearly larger than Cinghalese specimens and agrees well with 4 males from Kanara:—bill, 44-46; wing, 399-431; tail, 250-265 mm.

I therefore attribute all birds from Travancore to the continental form and for this Jerdon's name *melanotis,* wrongly given in *New Fauna,* vii, p. 410, as a synonym of the typical race, takes precedence of *minor.*

Butastur teesa (Franklin).

Circus teesa Franklin, P.Z.S. 1830-1831 (October 25, 1831), p. 115—Between Calcutta and Benares and in the Vindhyan Hills between the latter place and Gurra Mundela.

Not found by the Survey. The White-eyed Buzzard is far scarcer in the Presidency than in the rest of India and on the eastern side I only know of a male in the British Museum collected by Blanford north-west of Rajahmundry on 29 May 1871 and a local specimen in the Madras Museum, the basis for Dewar's inclusion in his list.

On the west it is only recorded from Travancore where Ferguson says it is not uncommon in the low country but does not ascend the hills.

Haliaeëtus leucogaster (Gmelin).

Falco leucogaster Gmelin, Syst. Nat., vol. i, pt. i (1788), p. 257—no locality=New South Wales.

How far the White-bellied Sea-Eagle is distributed along the wide-flung coast-line of the Madras Presidency is not certain but it has as yet only been recorded from a few localities. There are two 'Madras' specimens in the British Museum, as well as a bird in the Hume Collection from Narasapatam, Vizianagaram. An interesting note by Mr. S. C. Law on two pairs observed by him at Vizagapatam will be found in the *Journal* (xxix, 1059). Dewar includes the species in his Madras list without comment. Jerdon (*Madras Jour. Lit. Sci.,* 1839, p. 65) says that he saw it over the Chilka Lake, at Ponay and again near Calicut.

Ichthyophaga ichthyaëtus (Horsfield).

Falco ichthyaëtus Horsfield, Trans. Linn. Soc., vol. xiii, pt. i (May 1821), p. 136—Java.

I can find no information about the Large Grey-headed Fishing-Eagle in the Presidency except the statement (*Nidification,* iv, 82) that Stewart found it breeding in Travancore and Betts' record from Coorg. The latter states that the only pair he had seen haunted a small tank in the jungle on the Coorg-Mysore frontier where they had an eyrie up in a tree.

Hume considered (*S.F.*, v, 129) that Indian birds were smaller than Javan. So in the absence of specimens I have kept the name binomial.

Haliastur indus indus (Boddaert).

Falco indus Boddaert, Tabl. Pl. Enlum. (1783), p. 25 for Pl. Enl., 416—Pondicherry, India.

Specimens collected:—302 ♀ 1-6-29 Chitteri range 2,000 ft.; 597 ♂ 25-7-28 Tindivanum near Pondicherry.

Measurements:—

	Bill.	Wing.	Tail.	Tarsus.
1 ♂	34	371	194	51 mm.
1 ♀	—	391	200	49 mm.

The Brahminy Kite is a very common resident and generally distributed in the Presidency though there is no record of it north of the Godavery Delta where LaPersonne found it common on the river. It is exceedingly abundant about Madras itself, and in Salem district LaPersonne found it fairly common around villages, ascending also the Shevaroys and Chitteri Hills. In this area Foulkes (*J.B.N.H.S.*, xvi, 757) had an interesting experience in the Pikkili Hills in April, watching 600 birds collect nightly to roost.

On the western side Betts says that it is occasionally seen, though far from common, in Coorg. It is much more common in the Wynaad, according to William Davison, being found in every paddy field. All observers agree that the Brahminy Kite is less common in the Nilgiris, though a few may always be seen about the lake at Ootacamund. In none of the western ranges does it normally breed.

A note on this species catching termites with *Milvus m. govinda* at Geddesal, Coimbatore, will be found in the *Journal,* vol. xvii, 526 (C. E. C. Fischer).

In the Nelliampathies it is common in fine weather, coming up from the plains (Kinloch). Fairbank found it common on the tanks and ponds near the base of the Palnis and in these hills he observed it up to 4,000 ft. while Terry observed a pair at Kodaikanal, where they usually hawked about the lake.

In Travancore it is common all over the low country, preferring the neighbourhood of the sea and the palmyra plantations some miles inland. Here too it occasionally visits the hills in the hot weather.

Nothing appears to have been recorded about the breeding season of the Brahminy Kite in the Presidency except in Travancore where it is said to breed in January and February.

Milvus migrans govinda Sykes.

Milvus govinda Sykes, P.Z.S. 1832 (31 July 1832), p. 81—Dukhun.

Specimens collected:—264 ♀ 21-5-29 Shevaroy Hills 4,800 ft.; 325 ♀ 3-6-29 Chitteri range 2,000 ft.; 696 ♂ 15-8-29 Palkonda Hills 1,000 ft.; 1741 ♀ 29-4-1930 Jeypore Agency 3,000 ft.

Measurements:—

	Bill.	Wing.	Central tail.	Outer tail.
1 ♂ imm.	35.5	426	213	246 mm.
2 ♀ ad.	37-38.5	418-437	217-227	244-269 mm.
1 ♀ imm.	39	413	213	242.5 mm.

The Common Pariah Kite seems to be very generally distributed and numerous throughout the Presidency though there are few details available from the eastern side. The Survey specimens and two birds in the British Museum collected north of Ellore by Blanford are supplemented by Dewar's statement that it is found in great numbers at Madras. Here as at other ports it is found about the harbour. William Davison saw one accompany a ship the whole way from Madras to Calcutta (*S.F.*, ii, 150), and H. B.

Tilden (*J.B.N.H.S.*, xxxi, 526) saw one strike a wavelet in the harbour and after flopping about in the water for half an hour sink and drown.

On the western side the kite is apparently more of a local migrant. In Coorg according to Betts it occurs round most villages but not in great numbers and it disappears at the end of the hot weather, not apparently breeding in the district. There is no information about it in the Wynaad but in the Nilgiris it keeps mostly to the neighbourhood of the stations and villages, and is less numerous on the estates though found at all elevations. It is common from December to the beginning of the rains in June, but very few are to be seen during the South-West Monsoon.

Fischer remarks (*J.B.N.H.S.*, xvii, 526) on kites collecting to a termite hatch at Geddesal, Coimbatore, and he also remarks on the way they collect in Kollegal Taluk to eat dead silk-worms thrown out by the villagers.

In the Palnis the kite is common round the base of the hills but scarce over about 3,000 ft. It is common in fine weather in the Nelliampathies, but Kinloch believes it is only a daily visitor from the plains, not roosting in the hills.

In Travancore the bird is abundant in the low country and though common also in the hills is apparently only found up there in the hot weather, also possibly only as a daily visitor.

Ferguson gives the breeding season in Travancore as February and March. William Davison says that in the Nilgiris it is in December, January and February and at Madras he took the nest at the latter end of December.

In the pages of *Stray Feathers* (i, 160; iii, 35, 229-30, 275; iv, 272; viii, 180, 466; ix, 309; x, 181) there was a good deal of discussion as to whether the *Milvus govinda* of Sykes was the larger or the smaller of the two Peninsula forms. Brooks held that it was the larger bird *lineatus* whilst Hume maintained that it was the ordinary smaller bird since known by the name. There can be no doubt that Hume was correct and the type now in the British Museum, if correctly so designated, supports his view, being an ordinary adult bird (bill, 37; wing, 438; tail, 264 mm.). The further controversy as to whether there are two or three forms in India—in addition to *Milvus migrans migrans* since shown to breed in Baluchistan—was justified. The kite, like many other species, increases slightly in size in India from south to north, and the difference will be seen if these Survey specimens are compared with the following Punjab series in my collection:—

	Bill.	Wing.	Central tail.	Outer tail.
5 ♂ adult	38-40.5	435-471	221-247	266-310 mm.
1 ♂ imm.	38.5	453	234	266 mm.
3 ♀ adult	39-40.5	463-470	246-256	281-301 mm.
1 ♀ imm.	40.5	466	237	274.5 mm.

The South Indian series is, however, so small, and the number of intermediate birds so great that the recognition of two races in the Peninsula—in addition to the large Himalayan form *lineatus*—does not at present appear of value.

Elanus caeruleus vociferus (Latham).

Falco vociferus Latham, Index. Orn., vol. i (1790), p. 46—Coromandel Coast.

Not reported by the Survey. There is very little information about the status of the Black-winged Kite in the Presidency. On the eastern side all we know about it is furnished by the specimen in the Madras Museum from Kolambakkam, Chingleput District, and by Theobald's account (*Scrapbook*, p. 305) of the breeding of Montagu's Harrier in Salem district. This nest contained three feathered young on Christmas day and the description leaves no doubt in my mind that the nest really belonged to the Black-winged Kite.

On the west the bird is better known. Primrose states (*J.B.N.H.S.*, xvi, 165) that he saw a pair hawking at Poda Padi at the foot of the South Wynaad Hills and specimens from the Wynaad (♀ 5-12-1877, Darling) and Sultan's Battery (♀ 19-2-1883, William Davison) are in the British Museum. Davison speaks of it as rare, saying that he had shot one some years previously at Neddivattum and that his shikari had got another below Kotagherry, the bird having been seen by him on perhaps half a dozen occasions in all.

Kinloch considered it somewhat rare in the Nelliampathies, only occasionally appearing as a visitor for a day from the plains.

Ferguson had only two records for Travancore. One was shot in Trivandrum and another seen in open grass land at Sastancotta in the low country near Quilon, both occasions being in March.

Circus macrourus (S. G. Gmelin).

Accipiter macrourus S. G. Gmelin, Nov. Comm. Acad. Petropol., vol. xv (1771), p. 439, pl. viii and ix—Voronezh to River Don, Russia.

Not obtained by the Survey. The Pale Harrier is a common winter visitor to the greater part of the Presidency, though as usual there are not many records from the eastern side.

In the Jeypore Hills, Vizagapatam, Donald met with a number collecting to roost with Marsh and Pied Harriers on a bare plateau on 13 February (*J.B.N.H.S.*, xvi, 504). Dewar was doubtful whether the species could be included in his Madras list but there is a specimen from Singaperumal Coil, Chingleput, in the Madras Museum and Major Bates informs me that Harriers, presumably of this species, were common at St. Thomas' Mount. There he first noted them in 1929 on October 16th and in 1924 on October 18th, and in 1930 they were common up till April 21st. A Harrier of some sort was seen on the grass farms on June 3rd and again about a mile up the Adyar River from the grass farm on June 13th.

In Coorg Betts gives the date of arrival as 4 November (1928) (*J.B.N.H.S.*, xxxiii, 718). A specimen collected in the Wynaad on 1 January 1878 by Darling is in the British Museum. In the Nilgiris William Davison considered it a very abundant winter visitor coming in about the end of October (first noted 23 October 1929 Betts, *J.B.N.H.S.*, xxxiv, 569) and seen as late as the last week in April. Primrose, however, points out (*J.B.N.H.S.*, xvi, 165) that they are usually not common above 5,000 ft.

In Travancore the Pale Harrier is not uncommon from November to February. It is found both in the low country and in exposed grass land on the High Range at 6,000 ft. There are specimens from both the Nilgiris and Travancore in the British Museum.

Circus pygargus Linnaeus.

Circus pygargus Linn., Syst. Nat., ed. x, vol. i (1758), p. 89—England.

Montagu's Harrier is doubtless a regular winter visitor to the Presidency and Hume remarks (*Scrapbook*, p. 306) that the Nilgiris provide one of the areas of its greatest abundance in India, though William Davison curiously enough does not include it in his list.

In Travancore, according to Ferguson, it arrives about December and is found both in the hills and plains. An adult male collected by Bourdillon at Eridge on 28 December 1877 is in the British Museum.

In Salem District Hume's collector, Theobald, stated that Montagu's Harrier was common from December until May or June and this identification was supported by specimens of which an adult male, collected on 18 January 1869, is in the British Museum. His account of the breeding in that district (*Scrapbook*, p. 305) was, however, evidently due to confusion with *Elanus caeruleus*.

The bird is included without comment by Dewar in his Madras list. It was not obtained by the Survey.

Circus melanoleucos (Pennant).

Falco melanoleucos Pennant, Ind. Zool. (1769), p. 2, pl. ii—Ceylon.

The Pied Harrier was not obtained or recorded by the Survey, but it is evidently a regular winter visitor and passage migrant (on its way to Ceylon) in the Presidency. Donald met with a few roosting with numbers of Marsh and Pale Harriers in the Jeypore Hills on 13 February (*J.B.N.H.S.*, xvi, 504). Dewar includes the species in his Madras list and a specimen from Chingleput is in the Madras Museum. Of three adult males in the

British Museum marked 'Madras' one at least apparently came from the neighbourhood of the capital.

On the west the Pied Harrier occurs but sparingly in the Wynaad and on the Nilgiris and their slopes according to William Davison, and Primrose (*J.B.N.H.S.*, xvi, 165) mentions seeing a few on the Terramia Tea Estate.

In Travancore, according to Ferguson, it is less common than the other species, frequenting the low country as well as the hills. A female collected by Bourdillon on 18 April 1877 in the Colathoorpolay Patnas 3,800 ft. is in the British Museum. In Travancore it may be seen as late as the beginning of April.

Circus aeruginosus aeruginosus (Linnaeus).

Falco aeruginosus Linnaeus, Syst. Nat., ed. x, vol. i (1758), p. 91—Sweden.

Not procured by the Survey. On the eastern side the Marsh Harrier is only recorded from the Jeypore Hills, Vizagapatam, where Donald found it the most numerous species in the congregation of Harriers at a roost on a bare plateau on 13 February (*J.B.N.H.S.*, xvi, 504).

On the west it is a fairly common winter visitor. Betts' date of first arrival in 1932 in Coorg, namely September 26 (*J.B.N.H.S.*, xxxvii, 225) and William Davison's specimen in the British Museum, collected in the Brahmagherries on 16 April 1881, suggest the normal duration of its stay in the Presidency.

William Davison says that the Marsh Harrier is not uncommon on the Nilgiris and their slopes. Primrose records a bird at a small swamp in the Terramia Tea garden (*J.B.N.H.S.*, xvi, 165), and a male collected at Kotagiri (Cockburn) on 28 January 1875 is in the British Museum.

In Travancore, according to Ferguson, this is the commonest Harrier, found about paddy fields in the low country from October to April. It does not, however, ascend the hills.

Buteo buteo burmanicus Hume.

Buteo burmanicus Hume, Stray Feathers, vol. iii (1875), p. 30—Thayetmyo, Upper Pegu.

No specimen of a Buzzard was secured by the Survey, and the genus does not yet appear to have been recorded from the eastern side of the Presidency.

On the western side there are several records and one species appears to be a not uncommon winter visitor to the hill ranges. No two authors agree as to the identification or the nomenclature of the forms of Buzzard which are resident in or winter visitors to India, and I despair of ever being able to settle these oft-debated questions. There seems, however, to be little doubt that the Buzzards which visit South-West India in winter all belong to the smaller form which has been treated variously as *Buteo vulgaris, B. desertorum, B. plumipes, B. japonicus* or, as in the *New Fauna, Buteo buteo burmanicus*.

A male was shot by William Davison on 16 April 1881 in the Brahmagherries. This was described by Hume as *B. desertorum* in *Stray Feathers* (x, 159 and 338) after submission to Gurney.

Jerdon had previously shot a specimen in the Nilgiris and seen one or two others (*B. of I.*, i, p. 88). These he called *Buteo vulgaris* or *Buteo rufiventer.* William Davison also saw Buzzards on several occasions in the Nilgiris and on the strength of a specimen in the dark fuliginous plumage seen at Ootacamund attributed them to the name *Buteo plumipes*. This was also the name given by Hume to a specimen received by him from Bourdillon in Travancore (*S.F.*, iv, p. 358). Bourdillon called it a not uncommon winter visitor in December, January and February preferring high open country at 2,000 ft. and higher. Ferguson later added—under the name *desertorum*—that he had often seen them over the grassland at Ponmudi, without however obtaining a specimen.

It is stated in the *Old Fauna* (iii, 389) that the genus *Buteo* is remarkable amongst its near relatives in having no distinct immature plumage and this statement is very generally accepted as correct, and is agreed to in the *New Fauna* (v, 136). It seems curious therefore that on the next page Mr. Stuart

Baker has given separate keys to the adult and immature plumages, a procedure adopted in no other genus of the Falconidae.

Astur badius dussumieri Temminck and Lang.

Falco dussumieri Temminck and Lang., Planch. Color. d'Ois (November 1824), livr. 52, pl. 308—Bengal, India.

Specimens collected:—452A ♀ 20-6-29 Tirthamalai 1,000 ft.; 794 ♂ 4-9-29, 828 ♀ 18-9-29 Kodur 500 ft.; 861 [♂] 1-10-29, 915 [♀] 13-10-29 Seschachalam Hills 2,000 ft.

Measurements[1]:—

	Bill.	Wing.	Tail.	Tarsus.
2 ♂	19.5-20	176-178	137.5-141	47.5-48 mm.
3 ♀	22.5-23.5	204-208	156-163	48-54.5 mm.

Unless Jerdon's statement that the Shikra is very common through the whole of India is held to cover the eastern side of the Presidency we have no record of this species in that area beyond Gooty (*Nidification*, iv, 104), the Survey specimens and Dewar's inclusion of the name without comment in his Madras list. On the west there is more information. In Coorg it is widely spread but not common according to Betts. In the Wynaad it is common according to Primrose (*J.B.N.H.S.*, xvi, 165) and William Davison and thence it extends commonly up the slopes of the Nilgiris as far as the plateau, where however it is only sparsely distributed.

Kinloch says that the Shikra is common in the Nelliampathies. In Travancore Ferguson says it is a very common resident in the low country and at the foot of the hills. It ascends the hills occasionally but only where there is open land.

Bourdillon gives the breeding season in the Travancore plains from March to June. Stuart Baker (*New Fauna*, v, 148) says that Bourdillon and Stewart took eggs in February, March and May and in *Nidification* (iv, 102) on their authority he gives the breeding season as from the middle of January to the middle of April.

In the Nelliampathies Kinloch took eggs on 27th March and Howard Campbell took his eggs at Gooty on 22 February (*loc. cit.*).

The races of the Shikra are very difficult to define. It is clear that—speaking in general terms—a very small and dark race in Ceylon grades gradually into a large pale race in Turkestan but the degree and the gradation of these differences is so slight and their average is so obscured by individual variation that it is very difficult to know where to draw a line of demarcation between the different races.

As in any study of this species the sexes and the ages must be considered separately, it is necessary to point out that the *New Fauna* (v, 148) is wrong in saying that the adult female is like the adult male. The adult male Shikra has the entire upper plumage an ashy blue-grey with the central tail feathers unbarred, indeed unmarked save for in some cases an obsolescent spotting along the shafts, indicating the position of the vanished bars. The adult female, on the other hand, has the upper plumage dark smoky brown, washed with grey while the central tail feathers have rather more trace of barring extending also to their webs. This distinction is maintained in all adults that I have seen and the difference in size between the sexes is also very constant.

If Ceylon birds (*badius*) are compared with birds from Bengal (*dussumieri*) it will be found that in the adult male and female there is no constant difference in colour. Odd males from Ceylon and Southern India are darker above and similarly odd males from North-West India are paler and brighter. Some females from Ceylon and Southern India have the barring on the lower plumage darker and browner, but these differences are purely individual and probably do not affect 50 per cent of a series, so alone cannot be regarded as subspecific. The immature male and female in Ceylon are, however, very distinct, a very rich dark brown with bright rufous edging on the upper parts, contrasting definitely with the grey washed tail. The shaft streakings on the lower plumage are a very rich dark chocolate brown in colour. Immature birds from the continent are alike, whether in the North-West, Bengal, or further South. The upper parts are paler with pale fulvous edging and a grey wash so that there is little contrast with the upper surface of the tail. The streaks on the lower plumage are much paler, a more rufous brown. This character of the juvenile plumage in Ceylon justifies separation of the island race. It also is rather smaller:—

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[1] Adult and immature birds of the same sex do not appear to differ in size.

	Wing.	Tail.
6 ♂ adult Ceylon	177.5-182	129.5-132 mm.
6 ♀ adult Ceylon	195-202	147-158 mm.

The large race *cenchroides* I have difficulty in defining for lack of material from Russian territories. Both the adult male and female are much paler above and the barring of the lower parts is also very pale. The immature bird is similar to that of *dussumieri* but is perhaps a little paler above, though single birds could not be separated with certainty. I measure specimens from Bokhara, Kandahar and Quetta as follows:—

	Wing.	Tail.
3 ad. ♂	196-198	148-154 mm.
4 ad. ♀	214-238	174-180 mm.

Hartert gives the measurements as follows:—

	Wing.	Tail.
9 ♂	185-197	150-160 mm.
6 ♀	210-222	180-192 mm.

Between these two the intergrading is so complete and so gradual that no definite racial boundaries can be fixed and as a matter of practical convenience it is best to group all birds from India proper—including the Himalayas—as *dussumieri* recognising that the proportion of dark birds will be higher in extreme Southern India and the proportion of pale birds higher in N.-W. India as they approach the boundaries of the two extreme races. It is a matter of opinion whether Travancore birds should go with *badius* or *dussumieri*. Some adults are very dark. The only immature bird I have seen, on the other hand, agrees with *dussumieri*. Measurements overlap, but on the whole I am inclined to keep Travancore birds as *badius*.

Astur trivirgatus trivirgatus (Temm. and Lang.).

Falco trivirgatus Temm. and Lang., Planch. Color. d'Ois. (Octobre 1824), livr. 51, pl. 303—Sumatra.

The Crested Goshawk is known to occur along the western side of India from N. Kanara (not Khandesh as given in the *New Fauna*, v, 154 and *Nidification*, iv, 107, though on p. 108 it is given correctly) down to Travancore and again in Ceylon. It is of course resident.

In the Presidency Primrose says that he saw a few—though he did not consider it common—in the Wynaad (*J.B.N.H.S.*, xvi, 165). Jerdon did not consider it very rare in the Nilgiris but this statement is rather objected to by William Davison who states that whereas in the Nilgiris one may obtain two or three specimens in three or four months' hard collecting, he had seen five in a single morning in the Wynaad, between Nellacotta and Davala. It certainly keeps to the wilder parts of the Nilgiris and being a very silent bird may easily be overlooked. Kinloch calls it common in the Nelliampathies and his identification is confirmed by a specimen sent me, collected in December 1923.

In Travancore it is said to be by no means common, keeping mostly to the forest-clad hills and breeding at about 1,500-2,000 ft. (Bourdillon). Stewart, however, says that it breeds from the foothills up to some 3,000-3,500 ft.

Eggs have been taken in Travancore from 2nd March to 25 May (Stewart) but the latter date is considered unusually late.

There are only two specimens of the Crested Goshawk from Sumatra in the British Museum but they support the usually accepted statement that birds from S.-W. India agree with the typical race. It is perhaps unfortunate, however, that in *Nidification,* vol. iv, p. 107, Mr. Stuart Baker has selected this species as the most complete example of the affinity between birds from S. India and Ceylon and those of the Malay Peninsula, for it is quite impossible to keep S. Indian and Cinghalese birds under the same subspecific name.

Cinghalese birds differ from those of S.-W. India in the much deeper, more chocolate brown of the markings on the breast, flanks and upper abdomen in the adult. These markings are smaller in extent and pear-shaped in character so that the breast gives an impression of white, spotted with dark brown. In the continental birds, on the other hand the impression is more of a brown breast, with the feathers edged with white. The island form is also smaller.

	Bill.	Wing.	Tail.
2 adult ♂ Ceylon	24-25	183-184	150-152 mm.
4 adult ♀ Ceylon	27-27.5	199-206	157-168 mm.
6 adult ♂ S.-W. India	26-28	196-208	159-168 mm.
6 adult ♀ S.-W. India.	28.5-30.5	214-237	169-180 mm.

This insular form is clearly worth recognition and as no existing name refers to it I propose to call it

ASTUR TRIVIRGATUS LAYARDI subsp. nov.

Type:—♀ ad. Pillymally, Peak Forest, 15 August 1876 (Legge). British Museum Register No. 1878—10-4-23.

Astur trivirgatus indicus Hodgson.

Astur indicus Hodgson, Bengal Sporting Magazine, vol. viii (October 1836), p. 177—Nepal.

Specimen collected:—1740 [♂] 28-4-1930 Anantagiri 3,000 ft.

Measurements:—

Bill.	Wing.	Tail.
28	220	168 mm.

This fine adult male of the Crested Goshawk must from its measurements clearly be attributed to the Himalayan race, though as one would expect, it is slightly small for it and therefore intermediate in character. This provides the only record for the outlying corner of the Presidency though Jerdon says it is found in the Eastern Ghats and it is known to occur in Nagpur, Balaghat, Sambalpur, Singbhum and Manbhum. Birds from this latter area have already been attributed by Hume (*S.F.*, v, p. 8) to the Himalayan race.

Accipiter nisus nisosimilis (Tickell).

Falco nisosimilis Tickell, J.A.S.B., vol. ii (December 1833), p. 571—Marcha in Borabhum.

In spite of Jerdon's statement that the Sparrow Hawk is abundant on the Eastern Ghats, many being caught every year, it was not procured by the Survey and I have seen no specimens from this side of the Presidency. Dewar includes the bird without comment in his list, probably on the strength of the Red Hills specimen said to be in the Madras Museum.

On the eastern side the Sparrow Hawk seems to be a fairly regular winter visitor, though it is at present only recorded from the Nilgiris and Travancore Hills. In the former William Davison says that it occurs sparingly and he mentions an adult female collected by himself at Ootacamund on 7 February 1881, which is still in the British Museum. Immature females collected at Kotagherry on 25-11-74 and 11-12-74 by Miss Cockburn are also in the British

Museum. My own collection contains adult males collected at Ootacamund on 19-1-02 by Col. H. R. Baker and 13-2-1935 by Major E. G. Phythian-Adams.

An immature female collected by Bourdillon at Mynall in the hills in winter (*S.F.*, vii, 33 and *J.B.N.H.S.*, xv, 672) and an immature male collected by Fry in Travancore are also in the British Museum.

The above specimens all belong, in my opinion, to the large pale form to which Tickell's name is applied. Tickell's type is not in existence, so far as is known, and his description of an immature male, though detailed and good of its kind, is not sufficient to allow of racial discrimination. The name has however been applied to the Asiatic breeding form on grounds given by Hartert (*Vog. Pal. Fauna,* ii, p. 1155) and this attribution is satisfactory and may well stand.

I may here note that it is evident from the fine series in the British Museum that this form is the breeding bird of the Gilgit area, so the statement in *Nidification*, vol. iv, p. 110, that *melanoschistos* is the only race breeding in the limits of the Indian Empire is incorrect.

Accipiter virgatus besra Jerdon.

Accipiter besra Jerdon, Madras Jour. Lit. Sci., vol. x (1839), p. 84—Soonda Jungles.

The Besra was not procured by the Survey and there is very little recorded about its distribution in the Presidency. On the eastern side all I can find out about it is the existence of a local specimen in the Madras Museum and Jerdon's statement that it is found here and there in the Eastern Ghats. His Indian informants also told him that it was found occasionally in the tract of jungly country in South Arcot and Chingleput, bordering on Tanjore and Trichinopoly.

In the Nilgiris William Davison considered it rare. He obtained a couple of specimens (one of which is in the British Museum:—♂ adult 18-11-1881) and saw others on the Coonoor Ghat; an immature female collected at Kotagherry by Miss Cockburn on 16 June 1874 is also in the British Museum.

Kinloch says that it is very common in the Nelliampathies and Stuart Baker, on the authority of Stewart, says that it is common in Travancore. Here the breeding season is said to last from January to May, most eggs being laid in March and April (*Nidification,* iv, p. 112). The bird is doubtless a resident in our area.

The *New Fauna* admits only two races of Besra in India namely *A. v. besra* in Southern India and Ceylon and *A. v. affinis* across the whole of Northern India and the Himalayas.

There are, however, in my opinion three races, as Himalayan birds fall into the usual eastern and western races. Of these the eastern birds agree with *Accipiter affinis* Hodgson, *Bengal Sporting Mag.*, new series, vol. viii (1836), p. 179—Nepal. Western birds differ from them as follows:—

(1) Adult ♂. The upper parts are definitely paler with more of a dove-grey tint as opposed to sooty grey. The underparts are also slightly paler and I have seen no specimens of the type which has the underparts very like those of the adult female, a type that is common in the eastern form.

(2) Immature ♂. The upper parts are markedly paler, both as regards the brown colour of the feathers, the rufous edges to them and the pale area of the hindneck, which last is white as opposed to rich rufous. The lower parts are much paler, lacking the rich rufous wash on the throat and breast found on eastern birds.

Females, adult and immature, cannot individually be separated, but in a series western birds are slightly paler.

The birds which appear in winter in the United Provinces belong to this western form. As there does not appear to be any existing name applicable I propose to call it

ACCIPITER VIRGATUS KASHMIRIENSIS Subsp. nov.

Type:—♂ ad. 14 September 1868 Murree (Coll. C. H. T. Marshall), British Museum Collection Register No. 1885.8.19.641.

Measurements:—

		Bill.	Wing.	Tail.	Tarsus.
A. v. kashmiriensis	5 ad. ♂	18	165-167	127.5-130	49.5-53
	5 ad. ♀	21.5-23	196-207	153-160	55-58.5
	6 ad. ♂	18-20	165-173.5	123-135.5	48.5-53
A. v. affinis	5 ad. ♀	22-24	199-210	151-167	54.5-61

Accipiter virgatus besra of S. India and Ceylon is a much smaller bird as is shown by the following measurements:—

	Bill.	Wing.	Tail.	Tarsus.
4 ad. ♂	17-18	148-155	112-119.5	45.5-48 mm.
4 imm. ♀	21-22.5	178-187	137-148	52-55 mm.

It is, therefore, of the same size as the typical form (Java) but the latter is far more richly coloured.

Pernis ptilorhynchus ruficollis Lesson.

Pernis ruficollis Lesson, Traité d'Orn. (February 1830), p. 77—(patrie inconnue) Bengal.

Not procured by the Survey. The only record of the Crested Honey Buzzard on the eastern side of the Presidency which I can find is furnished by two specimens in the Madras Museum from Madras and Kodambakkam, as Dr. Gravely kindly informs me.

On the west William Davison says that the Honey Buzzard occurs throughout the Wynaad and a female collected by him at Manantoddy on 5 April 1881 is in the British Museum. It also occurs on the lower slopes of the Nilgiris where Primrose says (*J.B.N.H.S.*, xvi, p. 166) that he collected two specimens and saw a few others. A specimen from Kotagiri is in the British Museum.

In Travancore Ferguson secured a specimen at Pirmaid near the Periyar dam in January 1901.

Nothing accurate is known about the status of the Crested Honey Buzzard in the Presidency and there is little warrant for the statement in *Nidification* (iv, 116) that the bird is resident in Ceylon. Legge was clearly of opinion that it was an immigrant and did not breed in the island.

Baza leuphotes leuphotes (Dumont).

Falco leuphotes Dumont, Dict. Sci. Nat., xvi (1820), p. 217—Pondicherry.

Very little is known about the Black-crested Baza in the Presidency and it appears to be a very rare bird. The Survey did not meet with it. On the eastern side Jerdon informs us that he shot a specimen in a grove at Davroypilly in Nellore district. There is a specimen in the Madras Museum labelled Madras. The type specimen came from Pondicherry and there is a male in the Hume collection from Trichinopoly dated 1871. There is unfortunately nothing to show the month of any of the specimens but they were usually considered as supporting the hypothesis expressed by Legge that the Black-crested Baza was migratory, the birds which visited Ceylon in the cold weather probably having bred in the Eastern Himalayas.

On the western side this Baza is only recorded from Travancore and Stewart appears to have been the only observer to meet with it in that State. A specimen collected by him on 19 February 1914 in the Aneichardi Estate is in the British Museum. According to the *New Fauna* (vol. v, p. 172 and *Nidification*, iv, 121) the breeding season in Travancore is in February, March and April and Stewart took a nest of eggs on 4 July. If this is correct the bird can hardly be a migrant but Stewart obtained most of his eggs from native collectors and there may have been some mistake in the matter.

The statement (*loc. cit.*) that the young bird is unknown is incorrect. It was described by Bingham (*S.F.*, ix, 145) and it remains to be seen whether the differences attributed to the Burmese race *B. l. burmana* Sclater are not merely those of immaturity.

Baza jerdoni ceylonensis Legge.

Baza ceylonensis Legge, Stray Feathers, vol. iv (1876), p. 247—Kandy, Ceylon.

For many years Legge's Baza could only be included in the fauna of the Presidency on the strength of a single specimen, the immature male collected in the Wynaad on 17 October 1877 by Darling and fully described by Hume in *Stray Feathers,* vii, p. 151, and reported on by Gurney (*S.F.*, viii, p. 445). Since then it has been discovered in Travancore by Stewart who says that it is rare and difficult to locate (*New Fauna*, v, 176 and *Nidification,* iv, p. 123). The breeding season in Travancore is given as from early February to the end of April, most eggs being laid in March. There appears to be no doubt that it is resident.

(*To be continued*).

TO MALAYA FOR A RHINOCEROS.

BY

R. C. MORRIS, F.Z.S.

(*With* 2 *plates*).

Sanction having been obtained by Mr. Arthur S. Vernay from the Government of Perak, F.M.S., through Mr. Hubback, the Game Warden of Malaya, to collect a bull *Rhinoceros sondaicus* for the American Museum of Natural History, I was asked early in 1935 to undertake the expedition with the assistance of Mr. H. C. Raven of the American Museum and Professor of Comparative Anatomy at the University of Columbia. Raven preceded me to Malaya by a fortnight with the idea of making all necessary arrangements on the spot, but he found the Game Warden away on tour and was unable to effect as much as he would have liked to. However, I do not think that this at all affected the final results.

Sailing from Madras on the s.s. *Rajula* on the 21st May I discovered that I could have joined the boat five days later at Negapatam! The Straits steamer from Madras meanders down the east coast picking up and discharging cargo at the ports of Pondicherry, Cuddalore, Porto Nuovo, Karikal and Negapatam. However this enabled me to land at and see Pondicherry and Karikal, both French ports, and unromantic places they are. Pondicherry especially gives the landing visitor the impression of being 'unfinished' with the Place de Dupleix surrounded by tall unconnected pillars (apparently taken from some ancient temple) and the work on the statue of Dupleix never completed. Four iron stanchions, supports for a canopy over the statue, stand out in ugly contrast and spoil the beauty of the work. Here one sees those curious vehicles, the *push-push* carts, the only specimens of its kind in the world; built on the model of a Victoria horse-drawn carriage, of the size of a rickshaw but with four wheels and pushed from behind like a bath chair, the rackety-packety *push-push* cart is a comic spectacle. The coolies and boatmen that throng round the visitor on his arrival on the jetty insisting that his presence is required by the Commissioner of Police, the Collector of Customs or, if the names of these two officials make no impression, the Postmaster (!!), the idea being to extort bakshish as guides, are an intolerable nuisance. Karikal is said to flourish on smuggling. I landed at Negapatam to see a friend and found it uncomfortably hot and mighty unclean. Negapatam had to my mind the appearance of a dying port which had once seen far better days.

Sailing from Negapatam on the 26th we arrived at Penang at dawn on the 30th. The crossing was uneventful, the southern islands of the Nicobars were passed on the 28th and the northern end of Sumatra the following day. I was fortunate in having the Director of Irrigation and Drainage in Malaya and the

Director of Immigration with me on board, both very pleasant companions, and the former was especially helpful in giving me a letter of introduction to his superintendent in charge of Irrigation at Teloh Anson in Perak, F.M.S. On my arrival at Penang I was met by Mr. Coulson, the Government Treasurer, and received from him the greatest help. It is perhaps not generally known that both Penang and Singapore are islands and form, together with Malacca, the three Straits Settlements of Malaya. Malacca is itself a part of the Malay Peninsula, which also comprises the nine Native States of Perak, Pahang, Selangor, Negri Sembilan, Johore, Kedah, Perlis, Kelantan and Trengganu, the first four of which are federated and the remaining five unfederated. Penang is quite rightly called the most beautiful town of the East: the whole setting is truly gorgeous and the range of hills rising to 2,000 ft. on the eastern side, to the top of which runs a funicular railway from the town of Penang, forms a superb background to a beautiful scene. Very attractive are the Chinese girls in their gaily coloured 'pyjamas'-like clothes (surely these must have given rise to the modern Western beach-pyjamas). Late in the afternoon I boarded the Straits steamer, the s.s. *Krian*, arriving at Teloh Anson, on the mighty Perak river, at 7 a.m. on the following morning. Here I was met by the Superintendent of Customs who very kindly saw my things through and found R awaiting my arrival at the Rest House. The day was spent in fixing up the hire of a launch from the Superintendent of Irrigation, taking out Arms Licenses, seeing the District Officer, Mr. de Moubray, and in making final purchases. Mr. and Mrs. de Moubray were most kind and helpful to us. R had paid a visit to Mr. Hubback's headquarters at Kuala Lipis, Pahang, and had brought back with him four Pahang Malays as camp coolies. I was fortunate in that R could speak Malay, having picked it up some years ago while collecting in the Dutch East Indies, and it speaks well for R's memory that he had forgotten little. Malay is undoubtedly one of the easiest languages in the world to learn, it is indeed absurdly easy to pick up. It struck me as amusing that a Malay cooly could spell a Malay word in English without knowing a word of English! Although Malaya has a script of its own their language is now mostly learnt by the Malays themselves in Roman characters and the use of the Malay script is fast dying out. I found the Malays, nearly all are Mohamedans, a pleasant and cheery crowd, though notoriously lazy. Living in a wonderfully fertile and rich country the Malay has never had to work hard for his living.

June 1st saw us leave Teloh Anson and work up the Perak river, finally turning off up the river Kinta, a large tributary of the Perak, arriving at our first camp, Changkat Budiman, late in the afternoon. Here we camped in a hut in a patch of rubber owned by some Indians. Mosquitoes were bad but luckily R had included in our outfit mosquito nets for our party. Some of the eggs we had purchased in Teloh Anson were not too good and Mahmet, our excellent servant, informed us that he had found 'little fowls' inside several of them! Leaving camp early next morning with Ngah, the Game Ranger, kindly lent to us by Mr. Hubback, and four Sakais (aborigines of Malaya) I trekked northwards marching by compass, across the Kroh Reserve and had my first experience of the Malayan jungles. The going was extremely bad at times, swamp after swamp had to be crossed either knee, waist or, in one case, shoulder deep. Old tracks of elephants and fresh tracks of pig and tapir were seen but no sign of any rhino. Ngah, a nice old rogue, knew only a few words of English and described one track to me as that of a 'ham'. It took me quite a minute to realise that he meant pig. Very easy it must be to get lost in the dense and vast evergreen jungles of Malaya and a compass is most essential. Langurs of two types were seen, *Pithecus cristatus* and *P. obscurus*. The white-handed gibbon (*Hylobates lar*) and seermangs (*Symphalangus syndactylus*) were either seen or heard, as also the common tailed-macaque (*Macacus mandibularis*). The seermang is outwardly very similar to a gibbon and was formerly, in fact, classed among the *Hylobates*. Several hours of tiring struggle through swampy areas brought us to the Sakai villages at Pinggan and further on to a Chinese Rubber Plantation and shop on the Kinta river. R turned up an hour later in the motor launch. Returning with him to the Sakai villages we discussed with them the prospects of finding a *Rhinoceros sondaicus* and a reward was offered. The Sakais were anything but optimistic. No tracks of *sondaicus* had been seen, we were informed, for a long time. On our way back to the river we were drenched to the skin in a torrential thunderstorm. Heavy rain fell almost daily although June is supposed to be one of the dry months. That night we occupied a Malay's new unfurnished house, the Atap or Nipa palm roof of which was effectively rainproof.

Leaving early next morning by boat we landed and searched one of the few areas bordering the Kinta river which was not under flood water. There were no signs of any rhino tracks, of tapir a few. Proceeding in our launch further down we camped that night at Kampong Laba Kubong. From here I marched through a part of the forest bordering the Kinta with the idea of meeting R further up river. Water got into my compass and it was not functioning properly with the result that I found myself travelling in the wrong direction. Leading our way back we struggled through swamps and dwarf screw-pine, to traverse which we sometimes had to fell and walk along saplings, and eventually found ourselves on the bank of the Kinta again just as light was failing. On the opposite bank luckily was a fisherman's hut, and the owner obligingly took me upstream in his small sampan until I met R. On our way downstream again we picked up my men and camped for the night at Laba Kubong. In the morning, after collecting two or three squirrels in a rubber plantation surrounding the village, we proceeded downriver and turning up the river Kroh camped at some fishermen's huts about 2 miles up. I noticed every time I raised my shot gun to my shoulder a pleasant smell, the source of which puzzled me considerably until I found my gun had been cleaned with our skinner's 'Brilliantine'! Leaving R here I paddled up the Lampam river, a tributary of the river Kroh, in a sampan with four Sakais. Landing about 3 miles up we followed a path and then searched for rhino tracks all over that area. Fresh tracks of tapir were seen and old tracks of elephant, but none of rhino. The ground was mostly dry though three or four deep swamps were encountered. The leeches were bad here, although under similar conditions in other parts of the jungle we found none. On June 5th we again worked up the Lampam river with six Sakais and four Malays as porters and camped that night in one of the Elephant Control Patrol huts on a forest reserve boundary. Here we found the jungle had been quartered by lines cut through the forest prior to being felled for paddy cultivation. The Sakais made a fire with a modern petrol cigar lighter! I was also amused at seeing a message written in pencil on a tree blaze from one Game Ranger to another to the effect that food had been left for him in one of the Patrol Huts: *Barang-makantingal*, literally ('things to eat remain'). Leaving camp early we returned to the Lampam river and boated down in sampans to the launch at the fishermen's huts. Here the Sakais were paid off as we had satisfied ourselves that rhino were not to be found in the Kroh Reserve. Two or three more squirrels were collected. Travelling down the Kroh and Perak rivers we reached Teloh Anson by noon. In the afternoon Mr. Theodore Hubback with Mr. Plane, the Elephant Control Officer and Deputy Game Warden, turned up and our plans and future operations were discussed. Mr. Hubback agreed that it would be best to transfer our activities to the large area north of the Bernam river bordering the State of Selangor. On the following day we transported ourselves, our men and our kit in a hired lorry to Lima Blas Estate, a large oil palm concern, French-owned. Mr. Hubback had on the day before telephoned to the Danish Manager, Mr. Iversen, and we were most hospitably received and entertained. I cannot adequately express our appreciation of the hospitality and help we received from Mr. Iversen and his French assistants, Mr. Talau and Mr. Hine, especially the latter. I was glad at the opportunity of meeting again a first cousin of my wife who had married Talau. Hine turned up for dinner at Iversen's bungalow and I was amused to note that the four of us were of different nationalities; Iversen Danish, Hine French and R American. After an early breakfast we left next morning in one of the estate lorries guided by Hine on his motorbike to the boundary of the estate. Here our kit was dumped while Hine and I walked to a Sakai village across the Bernam river and then on to a further Sakai 'kampong' half-a-mile on. We had to cross the swollen Bernam river singly in a small sampan, the seat of which collapsed while I was in midstream. Hine's shout: 'Be careful, the crocodiles here are awful' just as the sampan was rocking dangerously and shipping any amount of water did not tend to increase the comfort of my mind! Arranging with Sakais there to procure others as porters for the following day we returned to the estate. Shortly afterwards some of the estate Tamil coolies carried our kit across to the Sakai village (Buloh Seruvas). These Sakais are often referred to by the Malays as '*oran utan*', literally 'people of the jungle', and this also is the meaning of the term used for the ape. I was interested to hear from Hine identically the same yarn as is to be heard in South India regarding the existence of Negrito Pygmies living on trees in the forest, never being seen by any one, and that the Sakais leave rice for them at the foot of trees, just as the jungle tribes in South India are supposed to do. I am convinced this is entirely a myth.

One of our Malay camp coolies developed a badly swollen face through coming in contact with a 'Rongas' tree. He certainly looked a pitiable sight with his face all swollen, eyes nearly closed and swellings on his neck and chest where he had spread the inflammation by scratching. The effect of touching the bark of this tree is similar to that of the Poison Ivy in America.

Most of the Sakais possess long blow-pipes and use them most skilfully, the poison on their darts being that of the 'Upas' tree as in North Burma and the Dutch East Indies, the tree in Malay being known as the 'Ipoh': probably the town of Ipoh draws its name from this tree.

Heavy thunderstorms were of daily occurrence. The loud and musical call of the Argus pheasant was frequently heard all day, as also the calls of the Seermangs and the 'Wah-Wah' or white gibbon.

Plane had put me on to the best anti-leech footgear I had hitherto seen; ordinary rubber boots with canvas uppers, tongue sewn to sides, and *cloth extensions up to just below the knee sewn into the boot*. Putties over this increase the life of the extensions and the whole is very effectively leech- and mosquito-proof.

These jungles lie directly under the mail-plane route between Europe, India, Burma, Siam, the Dutch East Indies and Australia. So used had the Sakais become to planes flying overhead that they did not deign to look up on hearing them.

We left our camp at Buloh Seruvas, having slept in a vacated Sakai's hut, and arrived at the Sakai village of Changkat Kereta, on the Erong river, in the evening. The going was not too bad but swampy in parts. Two or three old pits were passed, previously used by poachers for trapping rhino. Strangely enough this part of the forest between the Erong and Bernam rivers appeared to be leechless although conditions seemed to be favourable for them. The 'Jelutang' tree, the sap of which is tapped by the Chinese for the manufacture of chewing gum, occurs in these jungles. At Changkat Kereta I tasted my first Daurian, but I was quickly put off by the sickly smell without which the fruit would be quite palatable. Patches of Liberian coffee are cultivated round the Sakais' huts at Changkat Kereta, also pineapples, sugarcane, plantains, cocoanuts, areca palms, betel vines and limes. In their clearings (the usual shifting cultivation of jungle tribes) the Sakais grow rice and Cassava (Tapioca). We hired a Sakai's house for ourselves at Changkat Kereta and decided

Kroh River.

Sakai hut we occupied at Changkat Kereta (Base camp).

Photos by author.

to make our base camp here. The headman's house was adorned with a large clock and four lamps, two being of the petrol type, one acetylene and the fourth an oil lamp: I think only the last was in working order! The headman was not very helpful at the outset, expressing fear that Sakais would not be available for shikar as they were all out cutting rattan. I felt sure that he was fishing for a present, and on learning from him on the following morning that he *hoped* to be able to supply six men he was told that there was to be no hoping and that we required *eight* men without fail. This firm attitude had immediate results and all the men we required were easily procured. We did not find the climate pleasant, it was like that of a hot-house. R was feeling far from well the whole time and I found that scratches and insect bites on my legs were apt to suppurate. I spent the next three days in searching the forest for miles around for *sondaicus's* tracks but without success, although tracks of *Rhinoceros sumatrensis* were quite common. Here and there patches of ground in the forest, about 12 ft. in diameter, swept clean by the Argus pheasant were to be seen, as also fresh tracks of the Malayan bear (in Malay '*bruan*', probably the origin of 'Bruin' for a bear). Small hornets were a common feature in these forests and our Sakai trackers were frequently stung. On one occasion we had to run from hornets for 200 or 300 yards much to the merriment of the Game Ranger Ngah who thought it was a great joke until he was stung on the neck when his mirth ended in a yelp! The Sakais, like nearly all jungle folk, possess a keen sense of humour and are a cheery crowd: crossing the Erong river on a fallen tree on the first day the leading Sakai was deposited into the river by the log breaking in two, much to the joy of the others. Pig-tailed monkeys (locally known as '*beroke*'—*Macacus nemestrinus*) were common, as also the white-eyed langurs, specimens of both being collected. When the weather is fine the dry parts of the interior of these forests are really beautiful, but their beauty would be better appreciated but for the myriads of mosquitoes and other insects that bite and sting, in which respect these forests must surely correspond to those of Brazil. The fruit of one of the jungle trees, somewhat similar in appearance to a mango and locally known as 'Poonti' was quite good eating, a little like a custard apple. The water in the small rivers in this area was bright red in colour, especially in the case of one stream where the water had the appearance of having been dyed with potassium permanganate, probably due to the fact that these rivers are fed by swamps, the water being coloured by the roots of trees and rotting vegetation. It is noticeable that many of the scientific names of fauna are actually the Malay names for the creatures concerned such as *Tupaia* (tree shrew) from '*Tupai*', the Malay word for a squirrel; *Rusa* (sambhur = *Cervus rusa*), the Malay name for sambhur. The word 'godown' used in India is probably derived from the Malay word '*godang*' (shed) and a 'compound' is said to be derived from '*kampong*' (village) though this may be open to doubt. The traps laid by the Sakais in the jungle are chiefly for the Chevrotain or *Tragulus* (mouse deer) known in

Malay as 'Plandok', pheasant, and porcupine, the same trap serving for all: a wall of Zalacca palm leaves being placed on either side of, and across, a game path with a small doorway left for the victim to pass through straight into a noose. The undergrowth in large tracts of the forest is mainly Zalacca palm which adds a great deal to the beauty of the jungle. I noticed far less creepers and vines in these jungles than in similar type of forests in Upper Burma. In other parts the ground is covered by three or four species of plants with leaves akin to the Arum lily, and many of the swamps grow three species of tall and dwarf screw-pines. I came on the nest and eggs of a green forest-partridge one day having inadvertently disturbed this very beautiful bird. Sakais attach no value to empty bottles and tins and a lot of these can be seen thrown away round their houses.

On June 13th I left for my advanced camp, having had huts prepared in the forest some 12 miles north of Changkat Kereta, leaving R at our base camp. On my way I shot with my ·22 a fine specimen of a male seermang and sent it back to Raven. On arrival at my camp, on the upper reaches of the Erong, I had a bathe in the river while the Sakais completed a hut for themselves. That night I slept little being devoured by myriads of midges that invaded my mosquito curtain. For three days the jungle was searched for *sondaicus's* tracks without success. I had Sakais out in different directions quartering the jungle with the offer of a good reward for the discovery of a *sondaicus's* tracks. On the fourth day while some miles north-east of camp two Sakais caught me up and produced a 8½ in. stick which was declared to be the measurement of a fresh rhino track they had found. Although this was a bit small for a *sondaicus's* track I decided to follow it up. Returning to camp at noon I sent a Sakai to R with the information, and with Ngah and three men reached the spot where the rhino's tracks had been found 45 minutes later. The rhino's tracks had been found on a forest boundary separating the Chawang and Sungkei Reserves. Following up the tracks we eventually reached its wallow and from here on for a considerable distance the undergrowth through which the rhino had gone was caked with grey mud and our clothes were very soon similarly covered, and very much the worse for wear, following the rhino's path through rattan and Zalacca. Ngah's excellent tracking surprised me. We later came on a heap of the rhino's faeces, somewhat similar to a horse's droppings. It is well known to a rhino poacher that a rhinoceros is wont to return to the same spot to defecate, a habit it shares with some of the antelopes, and this, as often as not, leads to its destruction, the poacher occupying a machan over the spot. A rhino is worth Rs. 1,000 or more to the poacher, its chief value is in its horn, but every part of it possesses a definite value, including the blood, as an aphrodisiac. Shortly afterwards we came on the fresh tracks of a solitary elephant which sometimes covered the tracks of the rhino; and our difficulties were increased by a heavy thunderstorm which made it well nigh impossible to distinguish new from old rhino tracks. Added to this the light was becoming

Bernam River. Boundary between Perak and Selangor States.

Camp in dense evergreen forest in the Bernam area.

Photos by author.

very poor and I abandoned the search for the day. Although I felt fairly sure that the tracks were those of a large *sumatrensis* I decided to have this confirmed. It took us two hours to reach camp and a large part of the going was perfectly poisonous, we were frequently up to our knees in mud and water. Early next morning I left with Ngah and two men sending the remaining Sakais on to the Chawang river to prepare a new camp. Taking up the rhino's tracks again we found at about mid-day that the tracks had led under a fallen tree under which it was obviously impossible for a *sondaicus* to pass. This settled the question beyond doubt and we found our way to the Chawang camp by compass bearing. Later in the day we returned to our first camp and found R had arrived, and that night we discussed our future plans. We both felt that there was little chance of our coming on the tracks of a *sondaicus*, and R decided to catch the P. & O. boat to Hongkong from Singapore on the 20th, which involved his leaving for Teloh Anson early on the following morning. The forest west and north-west of the Chawang river had still to be examined, and I did not wish to abandon the search until this had been done, although I felt there was very little hope of success. Further I now had low fever nearly every day, and my legs were in a bad state from suppurating scratches and insect bites. R left early next morning still feeling none too well. Soon after he left I shifted everything to the new Chawang camp and arrived there feeling unable to do any tracking that day. Ngah and the Sakai trackers were sent out to continue the search. 'Miowk', my gibbon, who had been my devoted companion all through, was stung by a hornet on a tree near the camp and retreated yelling. Ngah and his men returned in the evening without having found anything but new elephant and *sumatrensis'* tracks. The next day found me still feeling feverish, but I accompanied Ngah while the other trackers went off in different directions as usual. No success attended our efforts either this or the following day. As our search had fairly covered this last area I decided to strike camp and return to headquarters, Teloh Anson. We left the Chawang river camp next morning and reached Changkat Kereta that afternoon. Here I paid off the Malays and all the Sakais, retaining those of Buloh Seruvas to accompany me to Lima Blas estate on the following day. My heavy outfit I sent round by boat down the Erong and Bernam rivers to Utan Milantang in charge of Gabriel, my skinner, with instructions to engage carts or a lorry for the kit and himself, Ngah, and our hardworking camp boy Mahmet, to Teloh Anson. The camp supplies that remained over in the shape of tinned fruits, rice, sugar, salt etc. I divided up between the camp staff. That evening I went over to the headmans' house hearing music and much noise, and found the Malays and Sakais gambling away all their pay! One of the Sakais was playing a violin quite well.

Leaving Changkat Kereta next morning I walked, carrying my gibbon, with the Buloh Seruvas Sakais arriving there at about noon. Here we were greeted by two damsels. These two young ladies, pretty girls in their way, went through the most blatant vamping tactics, directed at Raven and myself on our previous visit to the village, strutting around in gay rags and faces covered with powder and to our surprise using lip sticks and mirrors. Their remark in passing 'We are following you, Tuan', an idiom in itself, evoked our reply that we were taking no camp followers.

The Sakais of Malaya are considered to be the surviving representatives in the Malay Peninsula of the Indo-Malayans, as the Nagas, Kachins, Chins, Wahs, etc. are in Burma and Assam. The Tarajas of the Celebes, the Dyaks of Borneo and the hillmen of the mountains of Formosa and Philippines exhibit many of the same characteristics, have many of the same customs, and even similar words in their languages and nearly all are spirit worshippers. The 'Nat' poles, topped with funnel-shaped caskets, of the Burma races have very similar counterparts with the races of Malaya, the Dutch East Indies, Formosa and the Philippines.

A message that I was returning to Lima Blas had been sent on ahead and Hine met me between the Bernam river and the estate boundary. Arriving at Iversen's bungalow I arranged to leave for Teloh Anson the same evening in a hired car. Cars and lorries can be hired in Malaya at just about one-third of the rates in India. I reached Teloh Anson in what must have been almost record time, the driver being of the reckless speed-fiend type. Back in Teloh Anson I felt considerably better although pretty tired with my long day. The forests we had been through were, except for a few *sumatrensis,* tapir, pig, bear and elephant well-nigh gameless as was our experience in most of the evergreen forests of Upper Burma.

The next day was spent in drawing out funds from the Bank, in farewell visits to Mr. and Mrs. de Moubray and Mr. Ferguson and in re-sorting and packing up my outfit. My skinner Gabriel, Ngah, and Mahmet having turned up at noon I left the same evening on the s.s. *Krian* and arrived at Penang at 9 a.m. on the following morning. After making arrangements for the transfer of my luggage to the Madras boat, the s.s. *Rohna,* I spent the morning in Penang getting tickets for passages (Mahmet to Rangoon) and export licenses for my weapons. The s.s. *Rohna* sailed at 2 p.m. and the shores of Penang and Malaya were soon out of sight. Our route lay close in to the shores of Sumatra which we finally left behind us at noon on the following day. Our arrival at Madras on June 30th brought to a close an expedition which, though unsuccessful in its main object, was both interesting and instructive.

A further attempt to procure a specimen of a *Rhinoceros sondaicus* will probably be made in Sumatra where this species still exists.

THE INDIAN CADDIS-FLIES (*TRICHOPTERA*).

BY

MARTIN E. MOSELY, F.R.E.S.

(*With* 16 *text-figures and* 18 *plates*).

PART IV.

(*Continued from page* 133 *of volume* xxxviii).

LIMNOPHILIDAE.

Kolenati.—Gen. et Spec. Trich., vol. ii, p. 29, 1859.

CHARACTERS OF THE FAMILY.

Antennae as long as (rarely longer than or slightly shorter than) the wings, moderately stout, the basal joint bulbose. Ocelli always present. Maxillary palpi three-jointed in the male, five-jointed in the female, similar in structure in both sexes, only slightly pubescent, the basal joint short. Labial palpi small, the end joint often concave. Legs usually rather long; tibial spurs varying greatly, but the anterior tibiae are either spurless or have only one (apical) spur (excepting in *Astratus* where there is an unusually formed double black spur) and the intermediate have never more than three; tibiae and tarsi usually with strong spines. Abdomen generally short and robust; the margin of the eighth segment often produced. The appendages of the male tolerably constant in general character; that is to say, there is a pair of (ordinarily) small superior appendages, a pair of (ordinarily) lanceolate intermediate appendages, and a pair of inferior appendages, often fused to the ninth segment. Between these appendages is placed the penis which is usually short and cylindrical and generally accompanied by a pair of sheaths which are often bifid or pectinate.

In the female the ninth segment is nearly always visible both dorsally and ventrally; above, it is generally accompanied by a pair of pubescent appendages, and below them there is ordinarily a testaceous tubular piece open in front. On the surface of the eighth ventral segment is the vulvar scale which is generally trifid, consisting of two side lobes and a more or less tongue-shaped median lobe.

Wings usually ample and only slightly pubescent; but sometimes there is a close dense pubescence and the membrane may be granulose and with long erect hairs which are more frequently confined to the veins. Normally the neuration is similar in both sexes. In the anterior wing, the discoidal cell is always closed (excepting in one or two aberrant forms); the sub-costa ends usually in the costa but in one sub-family it ends abruptly in a transverse nervule between the costa and radius; there is no median cellule and the cellula thyridii is always long and narrow; four basal cellules; the anastomosis is usually divided into two portions, the lower placed nearer the base of the wing than the upper but in some genera both portions are nearly in line; there are nine apical cellules, and forks Nos. 1, 2, 3 and 5 are present. The posterior wings are shorter and much broader, and broadly folded; the anal portion usually well developed: discoidal cell usually closed (but open in one group); eight apical cellules and forks Nos. 1, 2, 3 and 5 present.

There are three very anomalous genera which, however, have not as yet been recorded in the Indian fauna, *Anomalopteryx*, *Thamastes* and *Enoicyla;* of these the first two depart widely in their neuration from the general form, with rudimentary posterior wings, and, in *Enoicyla*, the female insect is to all intents and purposes, apterous.

There are several female examples in the British Museum and the author's collections belonging to the *Limnophilinae*. I refrain from naming these as it is very probable that some at least may be associated with males either already described or perhaps described here as new.

Sub-families.

Limnophilinae Ulmer.

Apataniinae Ulmer.

Characters of the Sub-families.

1. In the anterior wing, the sub-costa continues to the costal margin. Limnophilinae Ulm. (Text-fig. 1).
2. In the anterior wing, the sub-costa ends in a cross-vein joining the radius and costal margin. Apataniinae Ulm. (Text-fig. 14).

Limnophilinae Ulmer.

Limnophilinae Ulmer.—Ab. Natur. Ver. Hamb., xviii, pp. 42, 46, 1903.

The sub-family of the *Limnophilinae* contains most of the Indian *Limnophilid* genera, and might well be further subdivided in a work having a world-wide range. There are objections, however, to the creation of sub-families to deal with the fauna of a particular region, so I shall therefore restrict myself to the collecting together of certain genera into two groups in the hope that this course may render easier the study of the Indian *Limnophilinae*.

First will come the group of *Colpotaulius*, characterised by the formation of the anterior legs of the male, which differ from those of the female in having a deep groove along the femora lined with short black setae, and in the genera *Colpotaulius* and *Astratus*, having peculiarly shaped black spurs. In *Astratodina* the groove is present, but there are no spurs.

The remaining genera will not fit comfortably into a single group although most of them follow closely the pattern of Martynov's *Pseudostenophylax*.

I omit the European genus *Stenophylax* from my tables. Navás has described an Indian species in this genus. I am unable to recognise it from the description, and I think it doubtful in the extreme that the genus is really *Stenophylax* as we know it in Europe.

TABLE OF THE INDIAN LIMNOPHILINAE GENERA.

1. Insects in the male with a groove lined with black setae on the anterior femora, generally with a specialised black spur on this leg; female leg normal. (*Colpotaulius* group) 2

—Anterior leg of the male without the groove or specialised spur. 4

2. No specialised spur on the anterior leg. ASTRATODINA gen. nov. p. 450

—One or more specialised spurs on the anterior leg. 3

3. A single specialised black spur. COLPOTAULIUS Kol. p. 451

—Paired black spurs. ASTRATUS McLach. p. 452

4. In the male, first joint of the anterior tarsus much shorter than the second; discoidal cell in both sexes strongly excised along its upper margin. MICROPTERNA Stein p. 454

—In the male, first joint of the anterior tarsus not shorter than the second. 5

5. In the male, posterior wing with specialised scales or specialised hairs. 6

—Male posterior wing without such scales or hairs. 7

6. Scales or hairs in the anal region of the posterior wing either entirely or partly along A_2. PSEUDOSTENOPHYLAX Mart. p. 455

—Scales or hairs along the region of the sector. ASTENOPHYLODES gen. nov. p. 458

7. Posterior wing of the male with a strong triangular anal projection. STENOPHYLINA Mosely p. 460

—Posterior wing of the male normal. 8

8. All the tergites covered with long silky hairs. TRICHOPHYLAX gen. nov. p. 461

—Tergites normal. 9

9. Anterior wing of the male with a mass of black setae occupying the basal half of the costal area. PSEUDOHALESUS Mart. p. 462

—Anterior wing of the male without such setae. 10

10. Distal margin of the anterior wing undulating, neuration of the male posterior wing abnormal with only fork No. 5 present. HALESINUS Ulm. p. 465

—Margin of the anterior wing not undulating; posterior wing of the male normal. 11

11. Spurs 1, 2, 2. 12
—Spurs 1, 3, 4. 13

12. Fork No. 3 of the posterior wing passes the cross-vein at its apex. PLATYPHYLAX McLach. p. 467
—Fork No. 3 of the posterior wing meets the cross-vein at its apex. PHYLOSTENAX Mosely p. 468

13. Superior appendages very long, blade like (see Text-fig. 11). ANABOLIA Steph. p. 470
—Superior appendages not so long. 14

14. Discoidal cells of both wings much longer than their footstalks. STENOPHYLIELLA gen. nov. p. 471
—Discoidal cells of both wings shorter or as long as their footstalks. ASTENOPHYLINA gen. nov. p. 473

Astratodina gen. n.

Closely allied to *Colpotaulius* and *Astratus* but the ♂ without the specialised spurs on the anterior legs.

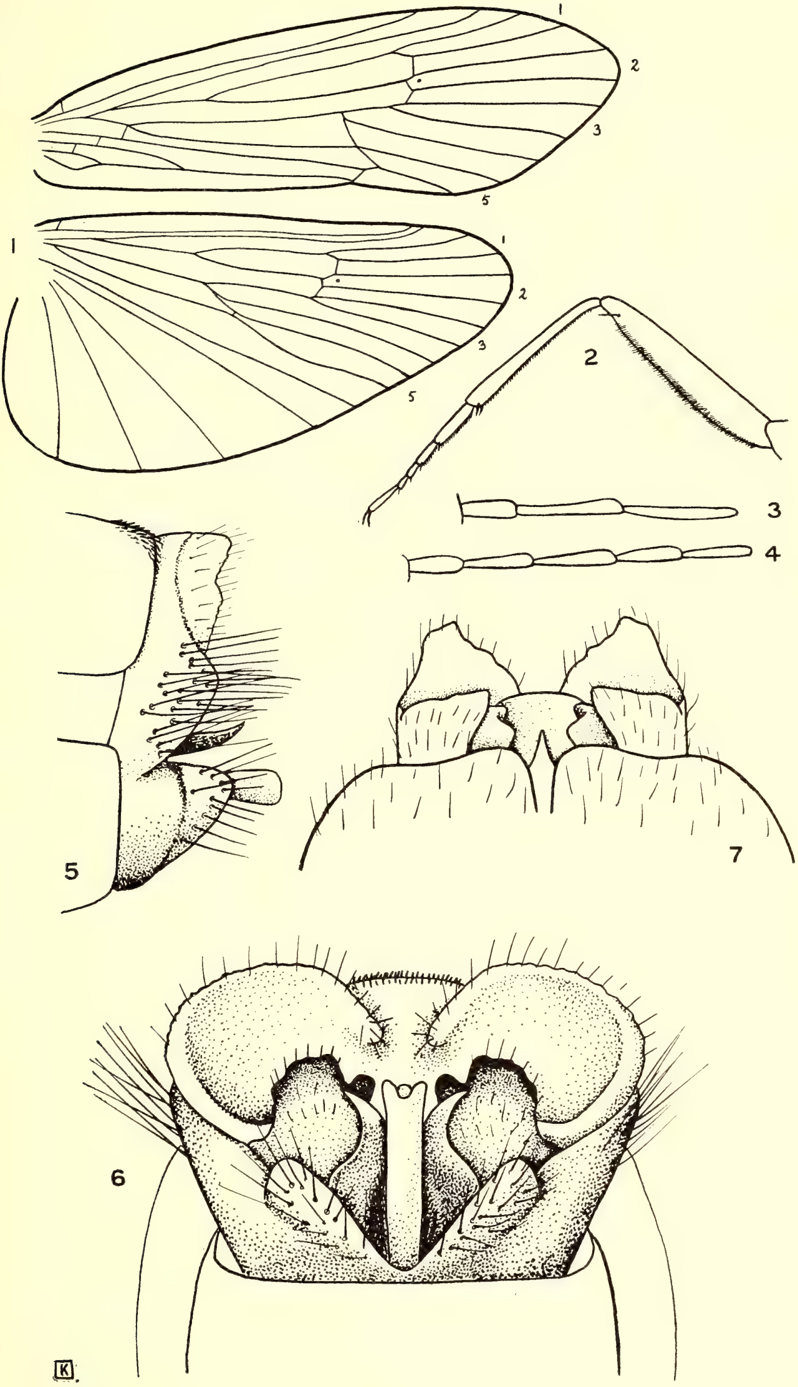
Antennae slender, about the length of the anterior wings, basal joint large and rounded, particularly on the inner side, next joint short; maxillary palpi ♂, first joint short; second long, about four times the length of the first; third slightly shorter than the second; ♀, basal joint short, about half the length of the second; third slightly longer than the second; fourth slightly longer than the first; fifth about as long as the second. Anterior wings elongate, costa somewhat rounded, apex sub-acute discoidal cell long (in both anterior and posterior), membrane granulose; legs differing in the sexes; ♂ with the anterior formed as in *Astratus* but without spurs, femora with a groove lined with black setae which are present also on the tibiae; first tarsal joint more than twice the length of the second; spines black, no spines on the terminal tarsal joints; spurs 0, 2, 2 ♂; 1, 2, 2 ♀.

Genotype: *Astratodina inermis* sp. n.

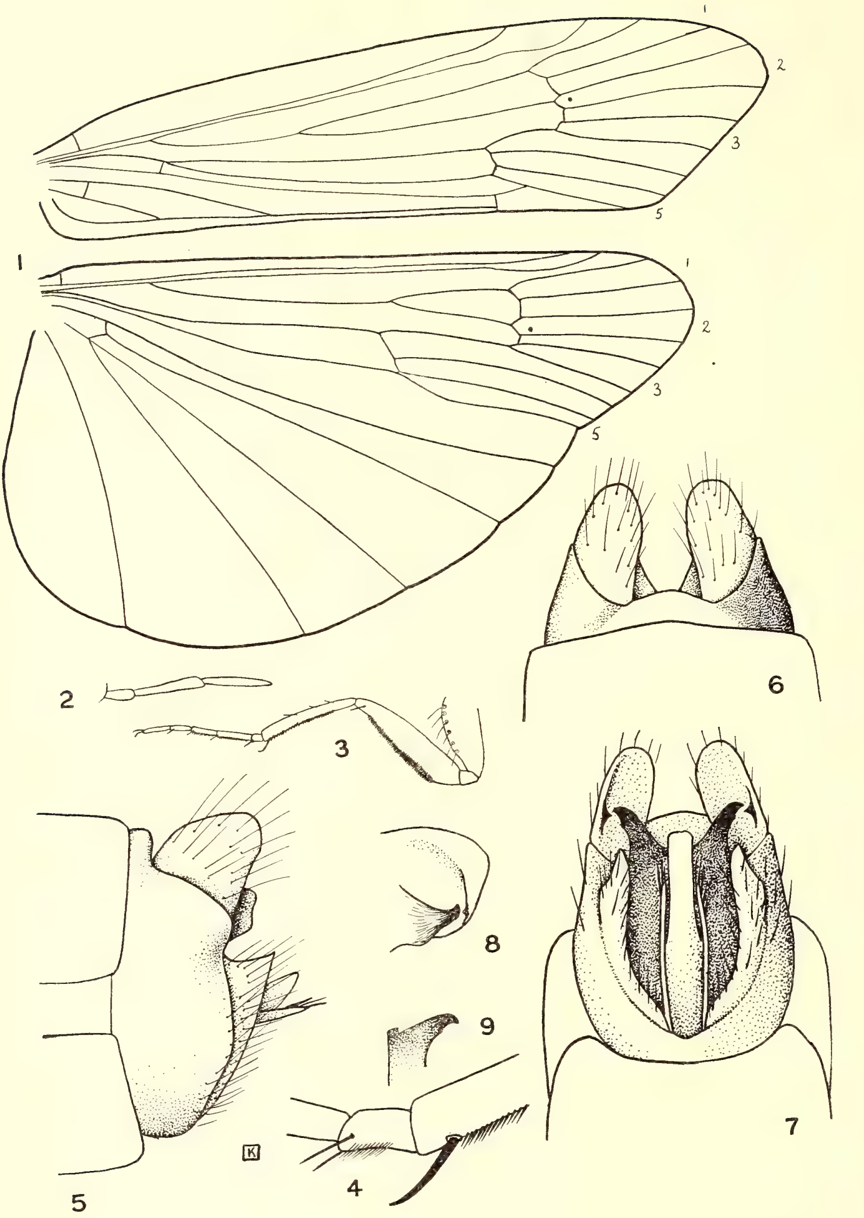
Astratodina inermis sp. n. (Pl. I, figs. 1-7).

Head dark fulvous, antennae lighter in colour than the head with still paler annulations; palpi and legs, pale fulvous; the anterior femur carries a single black spine (not a spur) on its outer surface towards the apex. Anterior wing elongate, cinereous with yellowish irrorations, membrane granulose with short yellowish hairs, fringes yellowish; neuration inclined to aberrancy, in one example the second and third apical sectors are bent inwards towards each other and united on one side by a cross vein, in others, neuration is normal.

Genitalia ♂.—Margin of the eighth dorsal segment rounded and set with short black setae; superior appendages are welded to the ninth segment making a pair of large rounded processes as seen from above; the ninth segment towards the centre of its lateral margin is heavily fringed with long stout bristles; from behind may be seen a pair of broad, strongly chitinised intermediate appendages, apices truncate, slightly serrate and deeply



Astratodina inermis sp.n., Fig. 1, wings ♂. Fig. 2, anterior leg ♂. Fig. 3, maxillary palpus ♂. Fig. 4, maxillary palpus ♀. Fig. 5, genitalia ♂, lateral. Fig. 6, ventral and slightly from behind. Fig. 7, genitalia ♀, ventral.



Colpotaulius major Mart., ♂. Fig. 1, wings. Fig. 2, maxillary palpus. Fig. 3, anterior leg. Fig. 4, specialised spur enlarged. Fig. 5, genitalia, lateral. Fig. 6, dorsal. Fig. 7, from behind. Fig. 8, superior appendage with apex of intermediate appendage, from within. Fig. 9, apex of intermediate appendage from behind.

notched towards their inner margins; penis-sheaths very strong and heavily chitinised, bases broad, apices acute, curving outward on each side of the penis which is short and straight; inferior appendages small and rounded, thickly beset with strong hairs and projecting only slightly beyond the ninth segment to which they appear to be welded.

♀.—The surface of all the dorsal segments set with minute setae, rather longer at the apical margin of the eighth; beyond this segment are two broad triangular processes with the inner margins somewhat serrate and carrying small rounded forks at their bases as seen from above; as seen from beneath, the processes are continued in broad inturned plates of which the inner apical angles appear as pointed projections; vulvar scale with two broad wings and a small and acute inner process; previous segment deeply and narrowly excised in the centre of its apical margin.

Length of anterior wing ♂ 12 mm.

Length of anterior wing ♀ 16 mm.

Western Tibet; Lhabaps, ft. 11,855, 23-vi-1932 G. E. Hutchinson, Yale North India Expedition.

Type ♂ and paratype ♀ in the British Museum collections, other paratypes ♂ and ♀ from the same locality in the collections of the Yale University, United States of America.

Colpotaulius Kol.

Colpotaulius Kolenati.—Gen. et Species Trichop., pt. 1, p. 47, 1848; McLachlan.—Rev. & Syn. Trich., p. 34, 1874; Ulmer.—Gen. Insect., fasc. 60a, p. 36, 1909.

Maxillary palpi ♂, basal joint less than half the length of the second which is slightly longer than the third; spurs 1, 3, 4 ♂ ♀ but that on the anterior tibia of the ♂ is differently formed to the equivalent spur in the ♀ being intensely black, sometimes long and thin with merely the apex slightly curved, sometimes stout and curved resembling a strong spine. First joint of the anterior tarsus in the ♂ only half the length of the second, whereas in the ♀ it is nearly one-third longer than the second. Tibiae with few spines on the anterior but they are more numerous on the two other pairs and on the tarsi; the anterior legs of the ♂ short and stout, the tibia fitting into a groove on the inner side of the femur, this groove being clothed with short and dense black setae. Antennae about the length of the wings, moderately stout. Anterior wings elongate with moderately dense short pubescence and evident apical fringe, costal margin gently rounded, the apex sub-acute; discoidal cell very long and narrow; no marked pterostigma. Posterior wings very deeply incised below the apex at the point where the lower branch of the cubitus terminates.

Genotype: *Colpotaulius incisus* Curt.

Colpotaulius major Mart. (Pl. II, figs. 1-9).

Colpotaulius major Martynov.—Zool. Jahrb. Bd. xxvii, pp. 516-8, pl. 24 figs. 1-4, 1909.

C. incisus Curt. n. var. Martynov.—Ann. Mus. Zool. ac. sci. U.R.S.S., vol. xxvi, p. 24, Pl. II fig. 9, 1925.

Head and thorax clothed with yellowish-grey hairs; antennae brownish testaceous with light-ochraceous annulations. Wings yellowish with brownish markings; under-surface of the anterior femora of the ♂ set with close black hairs, the abnormal single spur of this leg long, black and slightly curved at the tip.

Genitalia ♂.—Margin of the ninth dorsal segment slightly produced and rounded; superior appendages from above, large, obscuring all the rest of the genitalia excepting the inner margins of the intermediate appendages; the lower margin of each appendage is produced at its centre in a short, blackened, triangular, inturned spur; intermediate appendages from the side, broad at the bases terminating in acute blackened apices (hidden by superior appendages); from beneath, the appendages are directed slightly outward and are notched towards the inner angles of their apical margins so that they resemble a pair of boots placed heel to heel with the soles directed upwards and the toes well turned out; penis straight, apex blunt; penis-sheaths long and slender, apices pectinate; inferior appendages welded to the ninth segment; from the side, triangular, only slightly projecting beyond the line of juncture with the segment; from beneath, with only the apical third free and distinct from the segment, apices acute.

Length of anterior wing ♂ 12 mm.

Kashmir, Caucasus, Kamtshatka.

In the Ann. Mus. Zool. Ac. Sci., 1925, Martynov describes from Kamtshatka, a *Colpotaulius* as a variety of *C. incisus* Curt. The genitalia as figured differ far too widely from those of Curtis's species for the Kamtshatka insect to be associated with it even as a variety. On the other hand, the figures of these parts are indistinguishable from those given with the description of *C. major* and I conclude, in spite of the wideness of the range that the so-called variety is in fact this species.

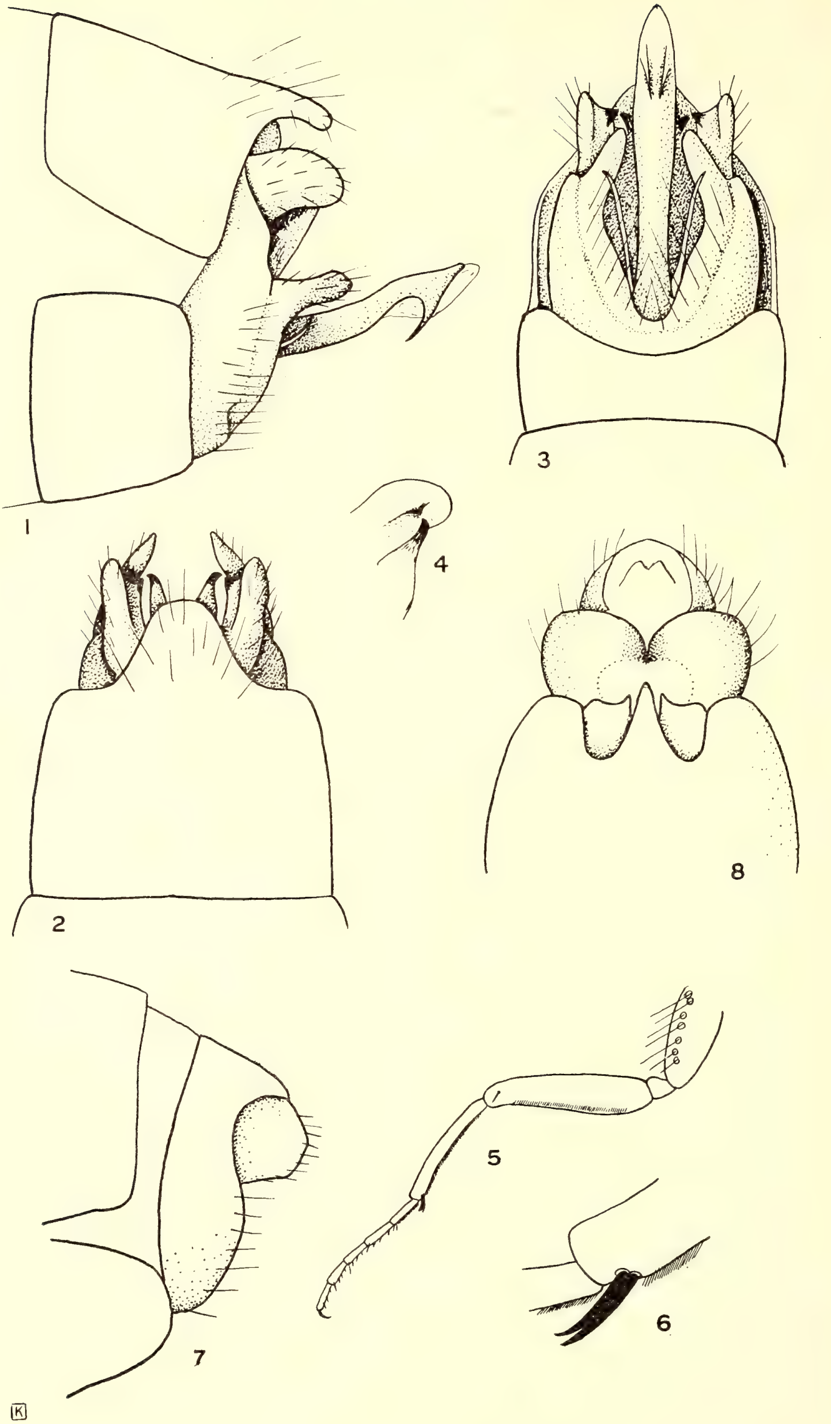
Astratus McL. (Text-figs. 1-3).

Astratus McLachlan.—Rev. and Syn. Trich., p. 36, 1874; Ulmer.—Gen. Insect., fasc. 60a, p. 37, 1907.

Maxillary palpi ♂, first joint about two-thirds the length of the second which is slightly longer than the third.

Maxillary palpi ♀, first joint about two-thirds the length of the second which is slightly shorter than the third, fourth as short as the first, fifth as long as the third; anterior wings elongate with moderately short pubescence; discoidal cell long and narrow; posterior wings somewhat excised below the apex; spurs ♂, 2, 3, 4 or 2, 3, 3, ♀ 1, 3, 4 or 1, 3, 3; anterior legs differing in form in the two sexes; in the male, femora broad, lower margins of the femora and tibiae lined with fringes of short black setae; spurs 2 in number, long, black, slightly hooked at the apices and set closely together in juxtaposition so that the presence of a second spur may easily be overlooked; first joint of the tarsus much longer than the second; in the female, the anterior leg normal with a single normally formed spur and no fringes of black setae; in the ♂ margin of the eighth dorsal segment strongly produced at its centre with the extreme apex generally fringed with short

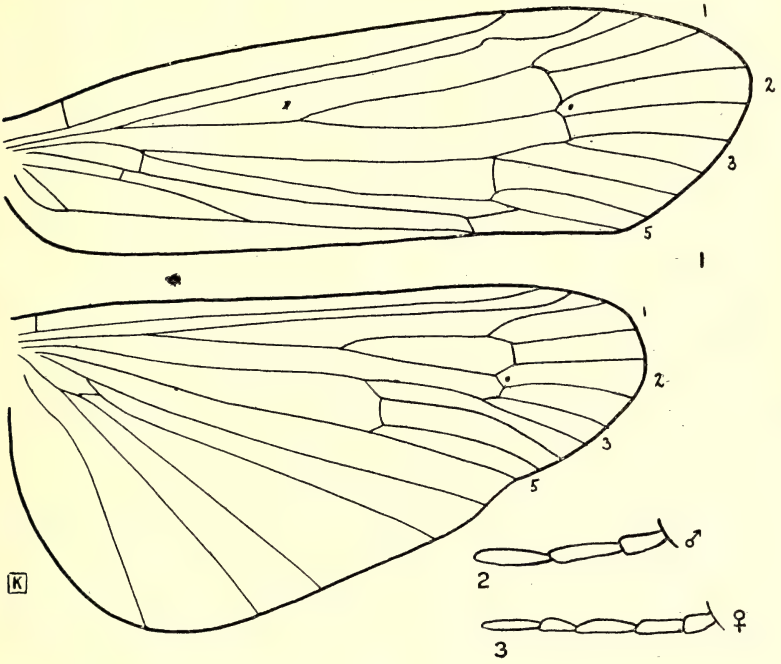
PLATE III



Astratus tricalcaratus sp.n., ♂. Fig. 1, genitalia, lateral. Fig. 2, dorsal. Fig. 3, ventral and from behind. Fig. 4, superior appendage with apex of intermediate appendage, from within. Fig. 5, anterior leg. Fig. 6, specialised spurs of the anterior leg, enlarged. Fig. 7, ♀ genitalia, lateral. Fig. 8, ♀ genitalia, ventral.

black setae; inferior appendages welded to the sides of the ninth segment.

Genotype: *Astratus asiaticus* McL.



Figs. 1–3. *Astratus tricalcaratus* sp.n., Fig. 1, wings ♂. Fig. 2, maxillary palpus ♂. Fig. 3, maxillary palpus ♀.

Astratus tricalcaratus sp. n. (Text.figs. 6-7; Pl. X, figs. 1-3).

Head testaceous, oculi dark testaceous, antennae of the same colour with darker annulations. Wings long, narrow, greyish, nervures dark; spurs ♂ 2, 3, 3, ♀ 1, 3, 3; spurs of the anterior leg ♂ as detailed in the generic description.

Genitalia ♂.—The apical margin of the eighth dorsal segment is strongly produced at the centre but there is no mat of short black setae lining the extreme apex; superior appendages from above, rather long; to each appendage there is an inner ridge carrying a stout spur whose extreme apex is blackened; this spur may be seen, both from above and beneath, projecting beyond the inner margin; from the side, the appendage is broad, broader at its base; intermediate appendages from the side, concealed by the superior appendage; they are very broad at the bases narrowing to strongly chitinised blackened and slightly hooked apices directed upwards and, from above, slightly outward; penis from the side deeply notched on the underside before the apex which carries two slender spines on its underside directed downwards and towards the base; penis-sheaths long and slender, curving slightly upwards from the side, divergent from beneath; inferior appendages welded to the sides of the ninth segment; from above narrow, apices directed slightly inward; from the side, the apices appear slightly twisted; lower margins strongly fringed; margin of the terminal ventral segment widely excised.

♀ General appearance resembling that of the ♂; genitalia.—From above, terminal dorsal segment produced and rounded; from beneath, can be seen below this segment two large rounded lobes; vulvar scale with a slender central piece extending slightly beyond the outer lobes whose apical margins are sinuous.

Length of anterior wing ♂ 9 mm.

Length of anterior wing ♀ 9.5 mm.

Western Tibet; Pangur Tso, 14,203 ft., 13-14-viii-1932, G. E. Hutchinson, Yale North India Expedition.

Type ♂ and paratypes ♂ and ♀ in the collection of the British Museum; other paratypes in the collection of the Yale University, U.S.A., all from the same locality.

A. tricalcaratus closely resembles Martynov's *A. alaicus* in the genitalia but differs vastly in general appearance and in having only 3 spurs to the posterior leg.

Micropterna Stein.

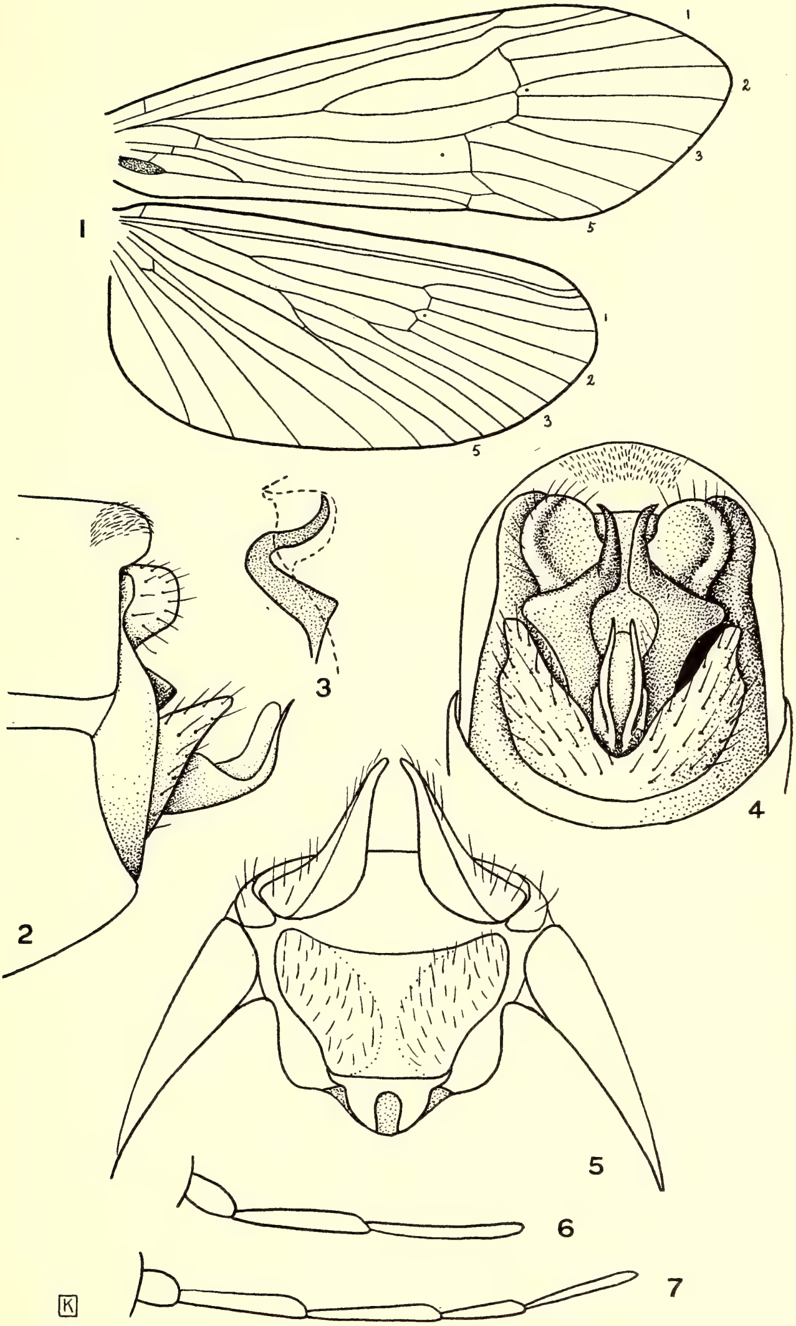
Micropterna Stein.—Stett. Ent. Zeit., p. 247, 1874; McLachlan.—Rev. and Syn. Trich., p. 137, 1874; Ulmer.—Gen. Insect., fasc. 60a, p. 53, 1907.

Antennae rather slender and shorter than the anterior wings; maxillary palpi ♂, first joint very short and rounded, second and third long; ♀, first joint very short, remaining joints long, with the fourth slightly shorter than the others. In the anterior tarsi of the ♂, the basal joint is very much shorter than the second joint and is sometimes thickened; spurs generally 0, 3, 4 or 0, 3, 3 in the ♂ and 1, 3, 4 in the ♀ but in the single described Indian species, the spurs are doubtful and appear to be 0, 2, 2 in the ♂ and 1, 2, 2 in the ♀. Anterior wings ordinarily elongate and broad with the apices sometimes rounded, sometimes sub-acute, costal margin more or less arcuate, pterostigma as a rule absent, discoidal cell strongly excised on its upper edge, first apical cell somewhat rounded at the base, third and fifth sub-acute, second and fourth slightly truncate; posterior wings broad, not perceptibly excised below the apex; the margin of the eighth dorsal segment is generally inturned and densely clothed with short black setae.

Genotype: *Micropterna testacea* Gmelen.

Micropterna indica sp. n. (Pl. IV, figs. 1-7).

Head ochraceous, antennae ochraceous, long and slender, palpi of the same colour; mesothorax ochraceous in the centre with wide black patches on each side; metathorax with two rounded black patches. Wings large, anterior rather long, apex sub-acute, pale stramineous, rather darker along the costa and sub-costa



Micropterna indica sp.n., Fig. 1, wings ♂. Fig. 2, genitalia ♂, lateral. Fig. 3, portion of intermediate appendage, lateral. Fig. 4, genitalia ♂, from behind. Fig. 5, genitalia ♀, ventral. Fig. 6, maxillary palpus ♂, Fig. 7, maxillary palpus ♀.

and towards the pterostigma which is only slightly indicated; in both sexes there is a narrow cell towards the base pigmented entirely with dark ochraceous; posterior wing broad, pale ochraceous. Legs ochraceous. Spurs of the anterior legs, 0 in the ♂ and 1 in the ♀; on the median and posterior legs doubtfully 2 in both sexes.

Genitalia ♂.—Margin of the eighth dorsal segment truncate and set with a close mass of rather pale coloured setae as compared with the black setae of most European species in the genus; superior appendages small and rounded, not visible from above and appearing as rounded lobes from the side; intermediate appendages only visible from behind, stout, black, their centres approximating each other, apices directed outward, bases diverging widely; penis slender, sheaths very slightly longer than the penis; as seen from the side, broad at the base narrowing abruptly at the centre and from there directed upward in a slender spine; inferior appendages from the side, wide at the base and tapering rather suddenly to a blunt apex.

Genitalia ♀.—From beneath, the abdomen terminates in a pair of finger-like processes, broad at their bases, apices acute; below these are two reniform, strongly chitinised hairy plates towards the base of which is the vulvar scale with broadish wings and a small central lobe.

In both sexes the margins of the sixth and seventh ventral segments are set with minute teeth.

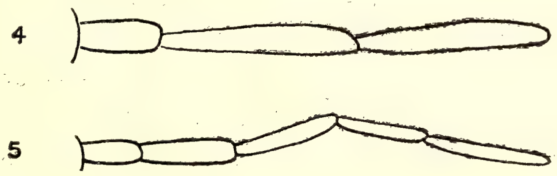
Length of anterior wing ♂ 18 mm.

Length of anterior wing ♀ 20 mm.

Type ♂ and paratype ♀ taken coupled, Kashmir, ft. 5,600, Khanabal, 20-ix-1923, Dutt. Coll. from the collection of the Imperial Institute of Agricultural Research, Pusa, Bihar, now in the collection of the British Museum.

Pseudostenophylax Mart. (Text-figs. 4-5).

Pseudostenophylax Martynov.—Ann. Mus. Zool. Acad. Imp. St. Peters, vol. xiv, pp. 281-2, 1909; Proc. Zool. Soc. Lond., Pt. I, No. 6, pp. 91-2, 1930.



Figs. 4–5. *Pseudostenophylax himalayanus* Mart., Fig. 4, maxillary palpus ♂. Fig. 5, maxillary palpus ♀.

♂ Maxillary palpi slender, first joint short, second and third more than twice the length of the first. ♀ first joint short, second nearly twice its length, third and fifth longer than the second, fourth as long as the second. Spurs 1, 3, 4. Terminal joint of each tarsus without spines (or with two or three very short ones only); anterior wings broad, rounded at the apices, greyish-yellow or testaceous with yellow spots; nervures strong; membrane granulose with very short semi-erect hairs; discoidal cell very long, much longer than its foot-stalk. Posterior wings sub-hyalin, posterior margin excised in the region of fork No. 5, fourth apical cell as broad as the second; in the anal region of the ♂ wing there are specialised hairs or scales.

Genotype: *Pseudostenophylax fumosus* Mart.

Pseudostenophylax martynovi sp.n. (Pl. V, figs. 1-6).

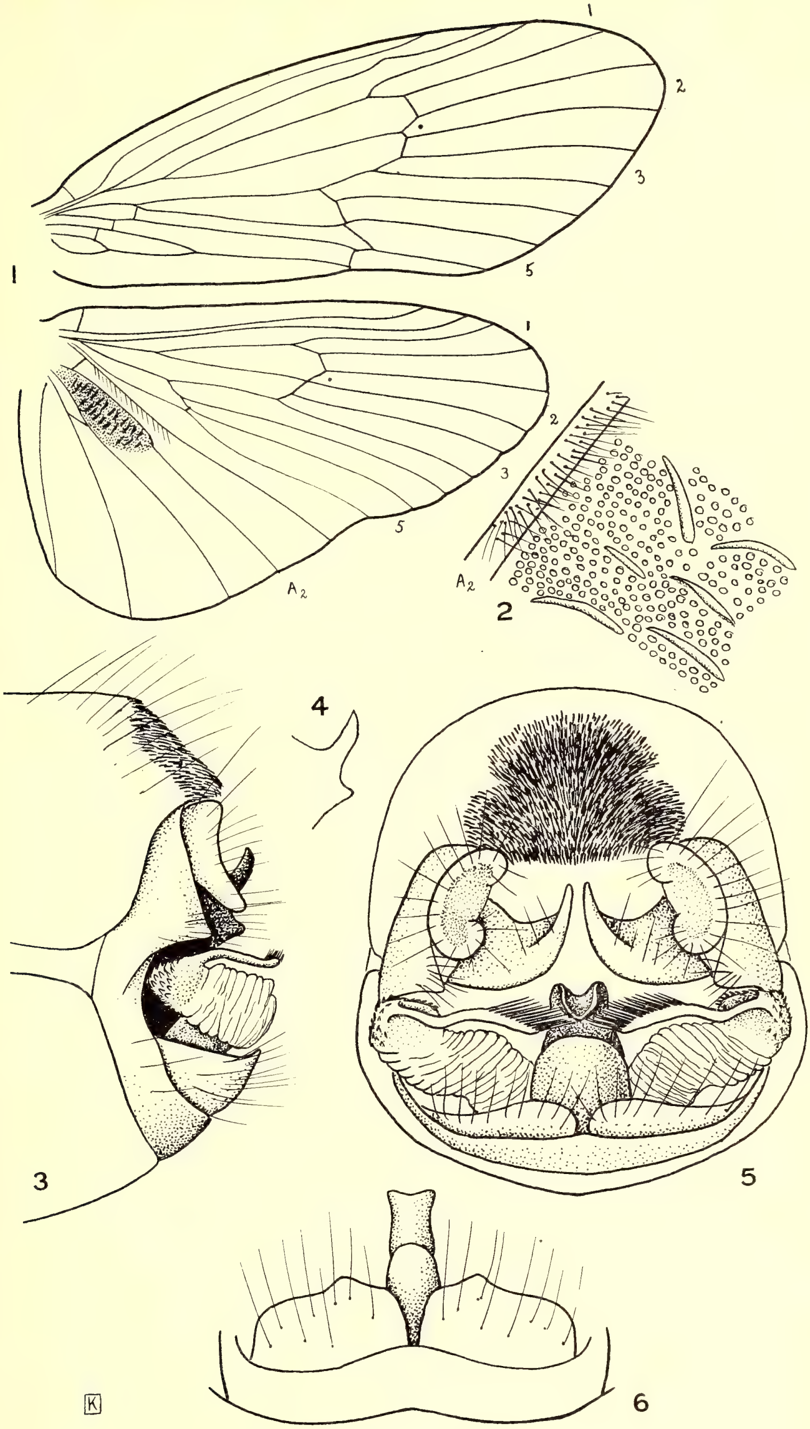
Pseudostenophylax himalayanus Martynov *partim*.—Proc. Zool. Soc. London, Part I, No. 6, pp. 92-5, figs. 37-41, 1930.

Head dark ochraceous, antennae and palpi pale ochraceous; wings, anterior, brownish irrorated with round yellowish spots; membrane granulose with numerous semi-erect and very fine black hairs and with a mass of dense black hairs fringing the costa making a narrow black rim to the costal margin. There is a dense mass of black hairs in the subcostal region at the base of the wing. Membrane of the posterior wing finely granulose, covered with small semi-erect dark hairs; at the base of the second anal vein is a long, rather broad yellowish area free from hairs but set transversely with some wide yellowish wax-like scales, the structure of which is very obscure. There is no fringe of scales clothing the second anal vein as in *himalayanus* and the yellowish area is confined to basal third of the vein. Basal portion of the wing deeper in proportion to its length than in *himalayanus*.

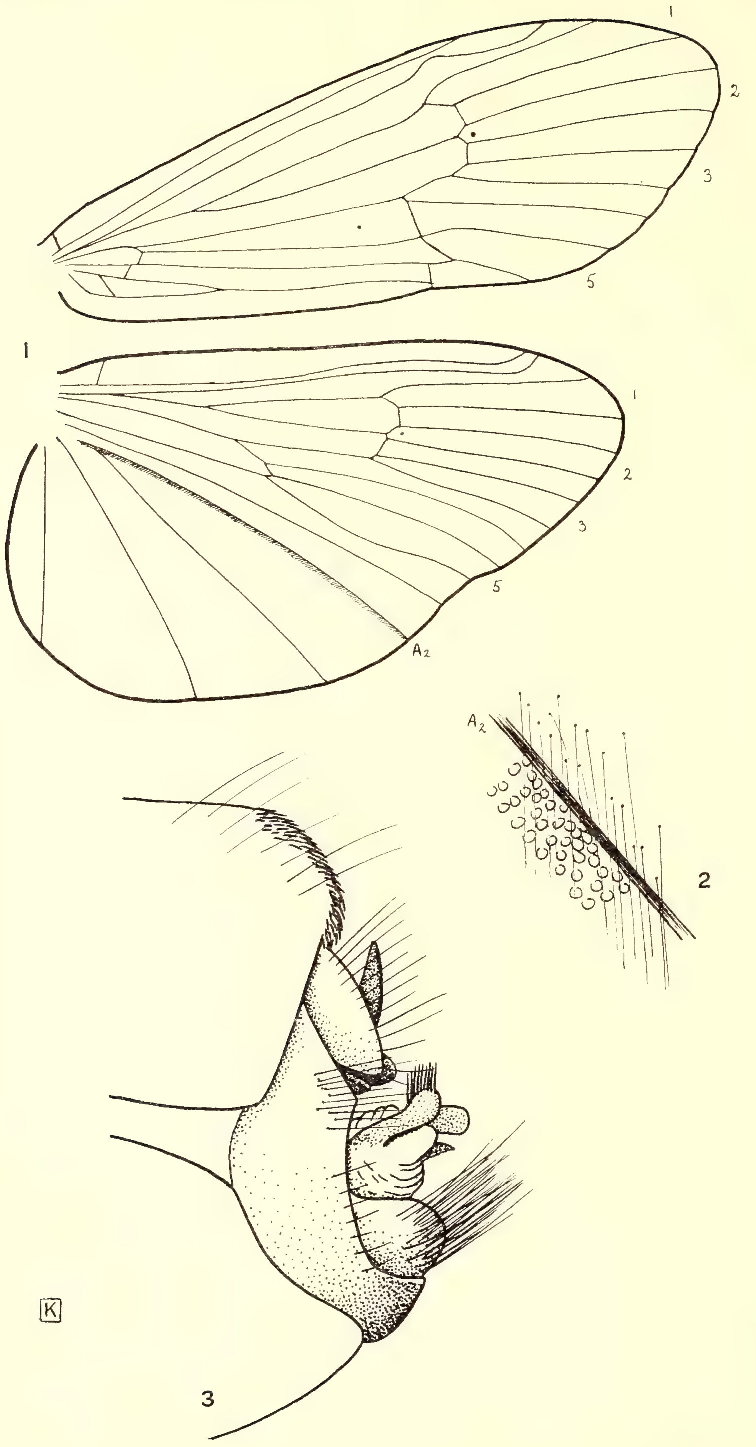
Genitalia ♂.—The margin of the eighth dorsal segment is produced and clothed with a dense mat of black setae which continue not very far round to the under side; there is a raised centre portion of the margin also densely covered with black setae. Side-pieces of the ninth segment triangular with acute apices; superior appendages from behind, ear-shaped, margins fringed with long black hairs; from the side, deep and narrow, apical margin concave, distinguishing the species from *himalayanus* in which the margin is convex; between these appendages, seen from behind, are the intermediate appendages broad at the base with narrow, pointed yellowish apices directed upwards and placed side by side; from the side, the base of the appendage projects nearly at right-angles; penis short and stout, apex from behind excised; lower penis-cover trough-shaped, set close beneath the penis; penis-sheaths with broad membranous bases and narrow strongly chitinised terminal portions bent inwards horizontally, apices furnished with stiff bristles; inferior appendges small and broad, margins fringed with long hairs and bearing slight projections towards the inner angles as seen from beneath; from the side, broad at the base, apex produced in a small blunt finger.

Length of anterior wing ♂ 21 mm.

Tibet; Yatung, 4,500 ft., A. E. Hobson,



Pseudostenophylax martynovi sp.n., ♂. Fig. 1, wings. Fig. 2, anal area of left posterior wing showing scales, enlarged. Fig. 3, genitalia, lateral. Fig. 4, apex of intermediate appendage, lateral. Fig. 5, genitalia, from behind. Fig. 6, inferior appendages, penis and lower penis-cover, etc., ventral.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Pseudostenophylax himalayanus Mart., ♂. Fig. **1**, wings. Fig. **2**, portion of right posterior wing around A2, enlarged. Fig. **3**, genitalia, lateral.

Type ♂ in the British Museum collection, abdomen mounted in balsam.

Pseudostenophylax himalayanus Martynov (Text-figs. 4-5; Pl. VI, figs. 1-3).

Pseudostenophylax himalayanus Mart. *partim.*—Proc. Zool. Soc. London, Pt. I, No. 6, pp. 92-5 but not figs. 38-41.

Head dark ochraceous; antennae, basal joint yellowish, remainder still paler with no apparent annulations, palpi and legs ochraceous. Wings, anterior, broad, rounded at the apices, membrane yellowish, granulose with short semi-erect yellowish hairs with rather larger blackish hairs in the sub-costal area darkening the base of the wing in this region; costa fringed with very short adpressed black hairs. The wing is irrorated, particularly in the post-costal region with round yellowish spots. Posterior wing yellowish, finely granulose with a dense row of thick whitish scales clothing the second anal vein to the margin of the wing. The basal portion of the wing is not so deep in proportion to its length as in the preceding species, *martynovi*.

Genitalia ♂.—Points of difference between the genitalia of *himalayanus* and *martynovi* few, and are as follows:—

There is no raised upper portion of the setae-clad margin of the eighth dorsal segment; superior appendages from the side with the outer margins convex instead of concave; the terminal portions of the penis-sheaths much broader; inferior appendages from the side, rounded, the apices are not acute as in *martynovi*.

Length of anterior wing ♂ 20 mm.

Tibet: Yatung, 4,500 ft., A. E. Hobson.

Type ♂ with the abdomen mounted in balsam, in the collection of the British Museum.

In the course of the examination of the examples of *P. himalayanus* in the British Museum collection for the purposes of this revision, it was discovered that the two ♂ examples collected by A. E. Hobson in Tibet, remaining in the British Museum, represented two distinct species.

In the light of the discovery, it became apparent that Martynov's description of the wings, more particularly of the posterior wing with its provision of scales 'in a dense row' clothing the vein A_2, referred to the one species but his figures of the genitalia, to the other. This is clearly evidenced by the concave outer margin of the superior appendage as seen from the side.

As the more important characters separating the two species are to be found in neuration, particularly the arrangement of the scales on the posterior wing, I have fixed the type of *himalayanus* as the species bearing the dense row of thick whitish scales. Martynov's figures of the genitalia (figs. 38-41, Proc. Zool. Lond., p. 93, 1930) agree perfectly with mine from the cleared abdomen of *martynovi*.

With regard to the ♀♀, it is impossible to say with certainty, with which species they should be associated and I therefore abstain from including descriptions here.

Pseudostenophylax griseolus Mart. (Pl. VII, figs. 1-4).

Pseudostenophylax griseolus Mart.—Proc. Zool. Soc. Lond., Pt. I, No. 7, pp. 97-8, 1930.

♀ 'Head reddish-brown above, testaceous in front; ocelli large, whitish; antennae brown, with distinct pale annulations; palpi testaceous. Thorax reddish-brown above, metanotum paler; underside of the thorax reddish-yellow. Legs yellow with black spines; spurs 1, 3, 3 yellow; on anterior tibiae some brownish spots around groups of spines; anterior tarsi also brownish. Anterior wings rather narrow with apical margin rounded; membrane granulose with minute hairs; pale brownish-grey irrorated with numerous small round hyaline spots; costal and sub-costal areas greyish-yellow; dorsal portion behind *Cu* brown, with distinct hyaline spots. *DC* very long, first apical fork impinging only slightly further inward than the second; cross vein *rs-m* equal to *irs* but oblique. Posterior wings sub-hyaline, minutely granulose and hairy; first apical fork impinging not further inward than the second. Abdomen dark brown, ochraceous beneath. Ninth segment rather broad in dorsal part, ventral portion projecting considerably backward and rounded if seen from the side. Subgenital apparatus composed of a very small median-lobe and two large pale testaceous side-lobes, concave on their inner posterior margins. Superior appendages fused with tenth segment, hairy, triangular as seen from above, united at their bases, apices produced in two slender stick-shaped processes. Side-lobes of tenth segment rounded in profile, broadly divided by a median excision beneath.

Length of body 8 mm. Expanse 27-28 mm.

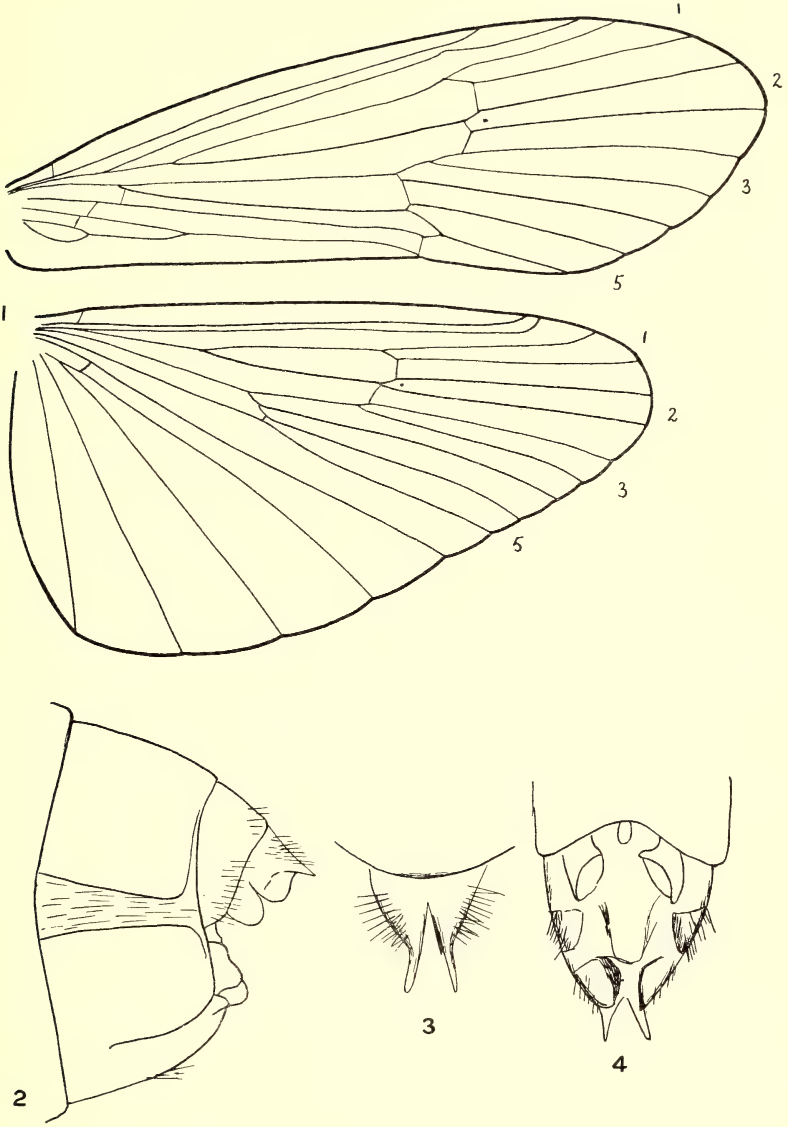
3 ♀♀ Sikkim: Khamba Jong, 15,000-16,000 ft., 15-30-vii-1903, Tibet Expedition, Lt.-Col. H. J. Walton.

The above is Martynov's description with reproduction of his figures. I am opposed to the description of new species from female types and have not therefore re-described and re-figured the species myself. I am inclined to the opinion that, having regard to the spur formula 1, 3, 3 and the shape of the posterior wing which is not perceptibly excised beneath the apex as in *Pseudostenophylax* species, *griseolus* might be better placed in the genus *Pseudohalesus;* in the absence of the male, I am not prepared to make a definite pronouncement.

Astenophylodes gen. n.

This genus may be separated from the nearly related *Pseudostenophylax* partly by the presence of spines on the terminal tarsal joint but mainly by the structure of the posterior wing.

Anterior wings rather elongate, apices sub-acute, discoidal cell long and narrow; posterior wing, discoidal cell long and reduced in width to dimensions quite unknown in any other recorded *Limnophilid* genus; the two branches of the sector enclosing this



Pseudostenophylax griseolus Mart., ♀. Fig. 1, wings. Fig. 2, genitalia, lateral. Fig. 3, dorsal. Fig. 4, ventral (genitalia after Martynov).

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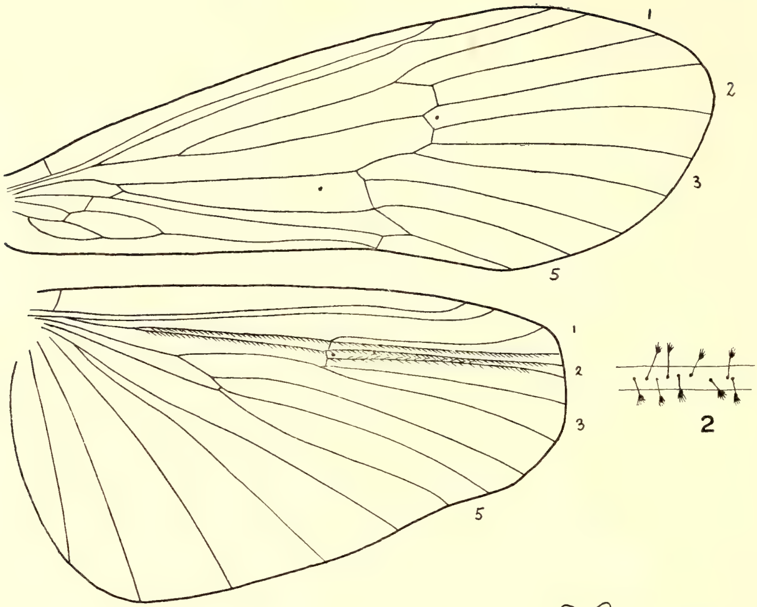

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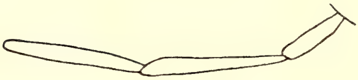

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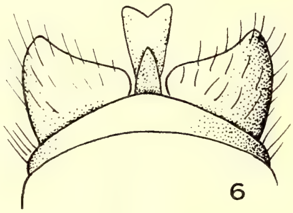

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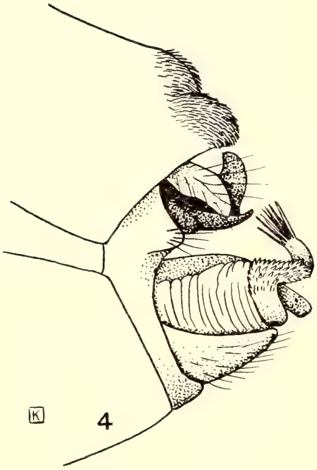

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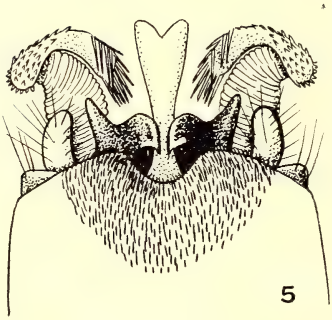

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Astenophylodes burmanus sp.n., ♂. Fig. 1, wings. Fig. 2, specialised hairs of posterior wing, enlarged. Fig. 3, maxillary palpus. Fig. 4, genitalia, lateral. Fig. 5, dorsal. Fig. 6, inferior appendages, penis and lower penis-cover, etc., ventral.

cell as also the second, third and fourth apical sectors carry rows of peculiarly formed scales each set on a long foot-stalk with a dilated head somewhat of the pattern of the *Lepidopterous battledor* scales. Forks Nos. 1, 2, 3 and 5 in both anterior and posterior wings present. Antennae rather slender, nearly as long as the anterior wing, basal joint large and dilated on its inner margin, adjacent joint very short and the next more than twice as long and longer than each of the remaining joints. Maxillary palpi ♂, basal joint about half the length of the second which is as long as or slightly longer than the third. Spurs 1, 3, 4.

Genotype: *Astenophylodes burmanus* sp. n.

Astenophylodes burmanus sp. n. (Pl. VIII, figs. 1-6).

Head dark fulvous; ocelli greenish-yellow; antennae, basal joint ochraceous, remaining joints fulvous with ochraceous annulations; palpi ochraceous; mesothorax fulvous with large, nearly black lateral markings.

Wings, anterior, dark fulvous with numerous yellowish irrorations, veins dark ochraceous, membrane granulose with innumerable short erect black setae, post-costal area beset with longish recumbent black hairs so that the wing is considerably darkened in this area; narrow darkened borders to the apical veins giving the wings a somewhat striate appearance; posterior wing also granulose, for the rest, as detailed in the generic description. Legs ochraceous with dark patches at the bases of each tarsal joint, spines black.

Genitalia ♂.—Margin of the eighth dorsal segment rounded, set with dense black setae to a considerable depth and with a deep semicircular excision at its centre; superior appendages short and yellowish furnished with rather long hairs particularly along the inner margins; intermediate appendages very strongly chitinised with bifurcate blackened apices, outer forks long and slender, inner wide and rounded as seen from above; from the side the inner fork has an outer convex margin and is directed upward and slightly backward; outer fork slender and directed backward; there is a small rounded lobe at the base of each appendage on its outer side; side-pieces of the ninth segment somewhat produced and triangular, set with long hairs; penis long and straight, apex dilated and widely excised; lower penis-cover strongly chitinised, narrow and tapering to a point; penis-sheaths membranous, from above, the apical extremities curved and lying transversely across the basal stem, outer ends of these transverse portions rounded and set with short teeth, inner ends with long stiff bristles; inferior appendages from beneath, short and broad, apices obliquely truncate, outer angles produced; margin of the ninth ventral segment produced at its centre.

Length of anterior wing ♂ 16 mm.

♀ unknown.

Burma 28°N., 97° 24″E., 11,000 ft., 29-vi-1926, F. Kingdon Ward.

Type ♂ in the British Museum collection, abdomen mounted in balsam.

Stenophylina Mosely.

Stenophylina Mosely.—Entom., lxix, p. 13, 1936.

Maxillary palpi with the basal joint about half the length of the second which is equal to the third; antennae long and stout, basal joint large and rounded, next joint very short, third longer, about two-thirds the length of the basal joint and longer than the following joints. Anterior wings broad, costal margin rounded, radius bent towards its apex nearly to meet the sub-costa; forks Nos. 1, 2, 3 and 5 present, all sessile; discoidal cell long and narrow; cellula thyridii long and narrow, extending towards the base beyond the cross-vein joining the cubitus and the first anal vein.

Posterior wing with forks Nos. 1, 2, 3 and 5, all sessile; there is a well-developed frenulum situated on the basal half of the costa, consisting of very long fine hairs; anal area produced in a large triangle; discoidal cell long and narrow.

Spurs 1, 3, 4. For genital characters, reference should be made to the description of the single species *mitchelli.*

Genotype: *Stenophylina mitchelli* sp. n.

The genus is evidently related to Martynov's *Pseudostenophylax* having regard to the genitalia, but the posterior wing lacks the specialised hairs or scales which is so characteristic of that genus.

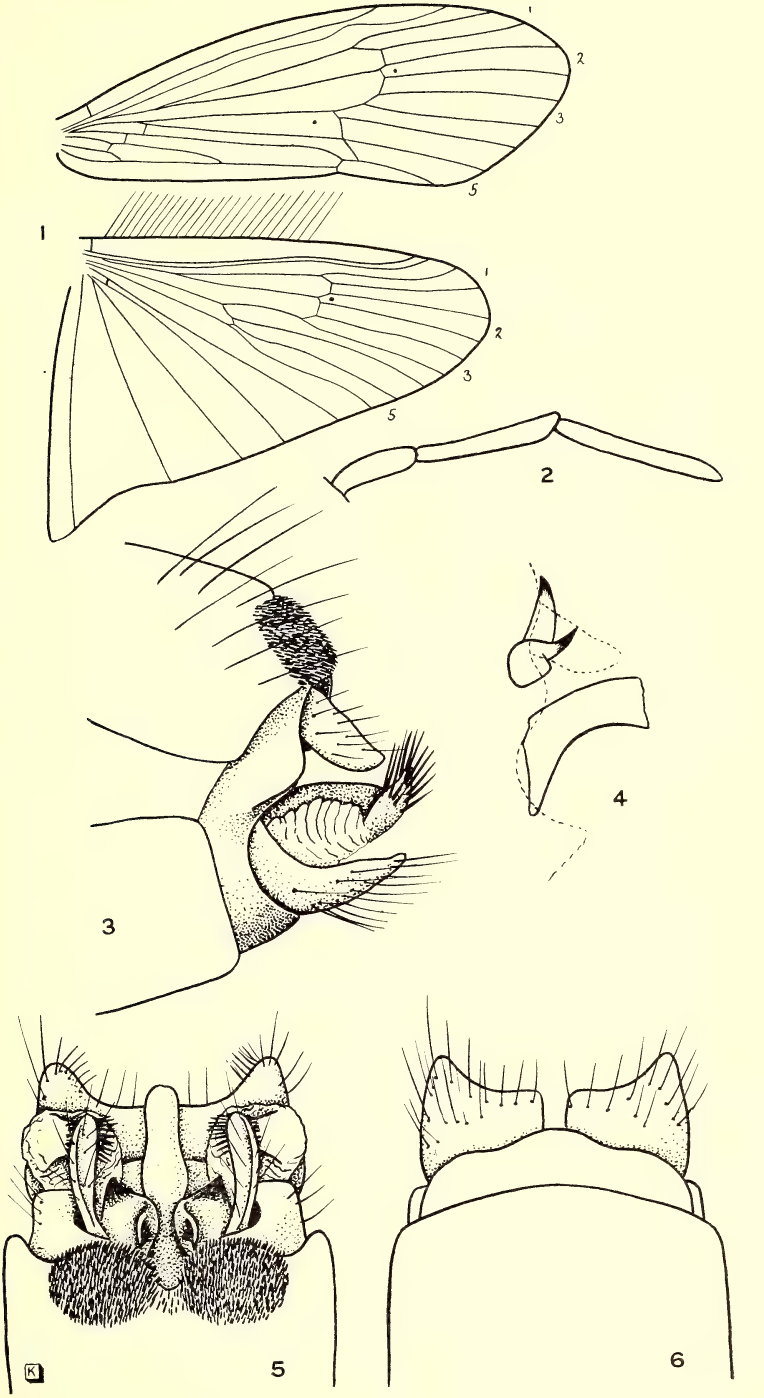
Stenophylina mitchelli Mosely (Pl. IX, figs. 1-6).

Stenophylina mitchelli Mosely.—Entom., lxix, pp. 13-14, 1936.

The two examples of this species are both mounted as balsam preparations. The wings are large and brown and the insects bear a general resemblance to species of the genus *Pseudostenophylax* but the costal margin of the anterior wing is far more rounded and the very extraordinary development of the anal region of the posterior wing renders this insect amply distinct from the *Pseudostenophylax* species. The general characters are given in the description of the genus.

Genitalia ♂.—The margin of the terminal dorsal segment is produced at its centre in two large rounded lobes closely set with minute black setae and with a deep excision between; superior appendages small and narrow; intermediate appendages from above broad and triangular, inner angles produced in strong black teeth directed upwards, apical angles also blackened; from the side, the apical angle appears as a short, slightly curved spur and the inner angle as a well-developed and much larger black upwardly-directed tooth. Penis from above, long, dilated slightly at the centre, apex rounded; from the side it curves slightly downward with a truncate apex. Penis-sheaths long and membranous, apices furnished with long bristles or teeth. Inferior appendages very broad, nearly quadrangular, apices truncate with the outer apical angles slightly produced; from the side the appendage is rather narrow with a concave upper margin and acute apex; the margin of the terminal ventral segment produced slightly at its centre.

Length of anterior wing ♂ 16 mm.



Stenophylina mitchelli sp.n., ♂. Fig. 1, wings. Fig. 2, maxillary palpus. Fig. 3, genitalia, lateral. Fig. 4, intermediate appendages and penis, lateral. Fig. 5, genitalia, dorsal. Fig. 6, inferior appendages, etc., ventral.

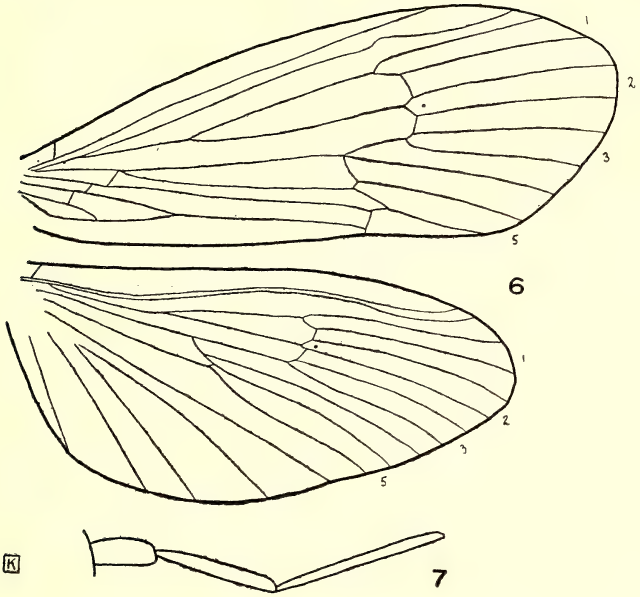
Kashmir: Lake Vishensar 12,000 ft., F. J. Mitchell.

Type ♂ and paratype ♂ in the author's collection, both mounted as balsam preparations, one pair of wings of the type mounted dry.

I dedicate this species to the memory of the late F. J. Mitchell to whom is due the introduction of trout into Indian waters and who took a keen interest in the entomology of Kashmir in its relationship to trout food.

Trichophylax gen. n. (Text-figs. 6-7).

Antennae broken away at the second basal joints in the unique example; basal joint long, second joint very short; maxillary palpi ♂, basal joint short, stout, about half the length of the second, third nearly half as long again as the second. Anterior wing, membrane granulose with erect black hairs particularly along the veins, apex broad and rounded, costa rounded; posterior wing only slightly broader than the anterior, also granulose with very small erect hairs; discoidal cell long in both wings. Spurs 1, 3, 4 (?), rather difficult to make out in the single example. Dorsal segments of the abdomen bearing long fine silky hairs. Genitalia conforming to the general pattern of the *Pseudostenophylax* group.



Figs. 6–7. *Trichophylax rotundipennis* sp.n., Fig. 6, wings ♂. Fig. 7, maxillary palpus ♂.

Genotype: *Trichophylax rotundipennis* sp. n.

This is the first Trichopteron I have seen with an abdomen provided with long fine hairs along the dorsal segments.

Trichophylax rotundipennis sp. n. (Pl. X, figs. 1-3).

Head dark fulvous, paler next to the oculi; antennae, palpi and legs fulvous. Other characters are given with the generic description.

Genitalia ♂.—The margin of the eighth dorsal segment bears at its centre a mat of unusually coarse black setae, the centre itself is produced and elevated so that the setae appear more dense in this region; superior appendages from above, short and slender, curving inwards and fringed with long hairs; from the side, broad at the base and tapering to a rounded apex; intermediate appendages from above appear as ear-shaped processes with blackened rims curving upwards at their inner and still more blackened margins; from the side the appendage appears as an upwardly directed rather stout process. Penis short and straight with a collar below the apex; penis-sheaths strongly developed with dilated triangular apical parts fringed with stout bristles and with the upper and lower apical angles bent sharply inward; inferior appendages short and broad, each with a short slender process arising from the interior margin towards the inner angle; the margins of the eighth and ninth ventral segments produced at their centres; there is a patch of short bristles on the eighth sternite towards the centre of its margin.

Length of anterior wing ♂ 16 mm.

Punjab: Murree, 6-ix-86. 46-83.

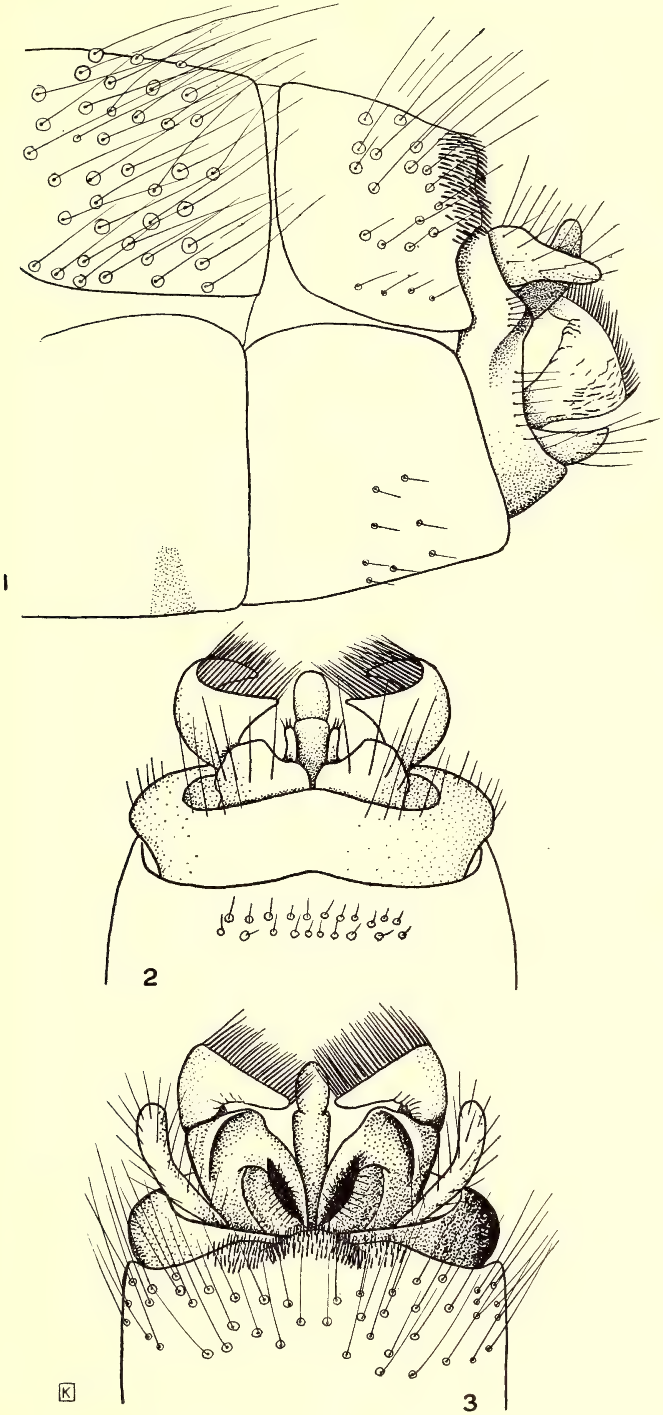
Type ♂, with the abdomen mounted in balsam, in the British Museum collection.

This species was found in the British Museum collection over the name *Stenophylax micraulax* McL. It is evident however that it has been wrongly determined. *S. micraulax*, as described by McLachlan, is characterised by a groove along the costal margin of the anterior wings, filled with black hairs and should therefore be placed in Martynov's genus *Pseudohalesus* (and not in *Pseudostenophylax* as Martynov suggests in Ann. Mus. Zool. Ac., 1927 and again in the Proc. Zool. Soc. Lond., 1930).

Pseudohalesus Martynov.

Pseudohalesus Martynov.—Ann. Mus. Zool. Acad. Sci. U.S.S.R., vol. xxviii, pp. 480-1, 1927.

Antennae rather short, basal joint bulbose, next joint very short, the next about three times longer and about twice as long as the following joints. Maxillary palpi of the ♂ with the basal joint very short, second and third long and equal; ♀, basal joint half the length of the second, third slightly longer than the second, fourth as long as the second, fifth slightly longer than the fourth. Anterior wings brownish, usually obliquely truncate at their apices, membrane granulose with numerous semi-erect, very short black hairs, rather longer along the veins; along the costal margin towards the base is a narrow fold filled with short black specialised hairs; the posterior wings are without the specialised hairs or



Trichophylax rotundipennis sp.n., ♂. Fig. 1, terminal abdominal segments and genitalia, lateral. Fig. 2, ventral. Fig. 3, dorsal.

scales found in *Pseudostenophylax*, membrane rather more granulose than usual and, as in the anterior, carrying numerous semi-erect hairs but smaller and less dense than in that wing; discoidal cell in both wings long. Legs, first joint of the anterior tarsus long, carrying a mat of short black setae along its under surface, spines black, few in number and absent on the terminal tarsal joint; spurs 1, 3, 3.

Genotype: *Pseudohalesus asiaticus* Ulmer.

Pseudohalesus kaschmirus Mart. (Text-fig. 8).

Pseudohalesus kaschmirus Mart.—Ann. Mus. Zool. Acad. Sci. U.R.S.S., xxviii, Pt. I, pp. 481-2, Pl. XXV, figs. 1-3, 1927.

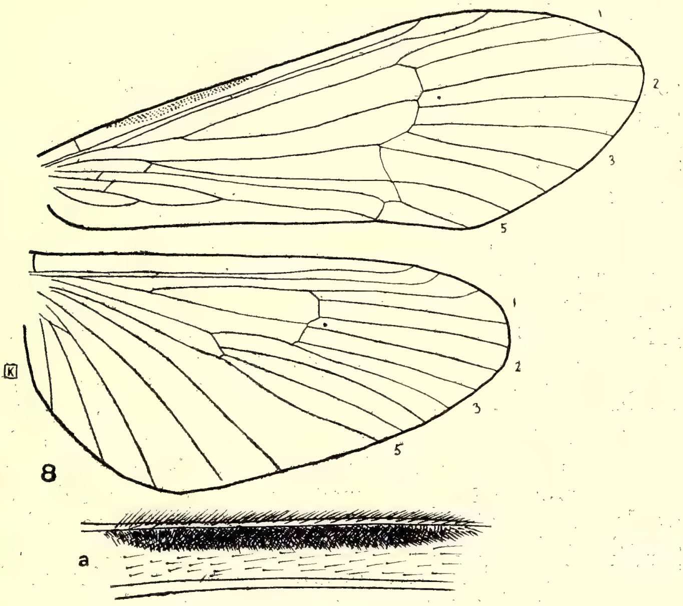


Fig. 8. *Pseudohalesus kaschmirus* Mart., wings ♂. 8A. costal area of anterior wing more enlarged.

This species is to be distinguished from *P. aberrans* only by its neuration and size. I have been able to find no satisfactory distinctions in the genitalia by which to separate the two species.

On a comparison of the figures of the wings of the two insects, it will be noticed that in both anterior and posterior, fork No. 1 is of normal width in *kaschmirus* and exceptionally narrow in *aberrans;* in the former species, fork No. 3 is present in both wings, in the latter, generally absent, in occasional examples present perhaps only in one wing and then unusually narrow.

Length of anterior wing ♂ 15 mm.

Western Tibet: Chagra, 15,215 ft., 4-vii-1932, G. E. Hutchinson, Yale North India Expedition; Kashmir, 7-8-vi-1910.

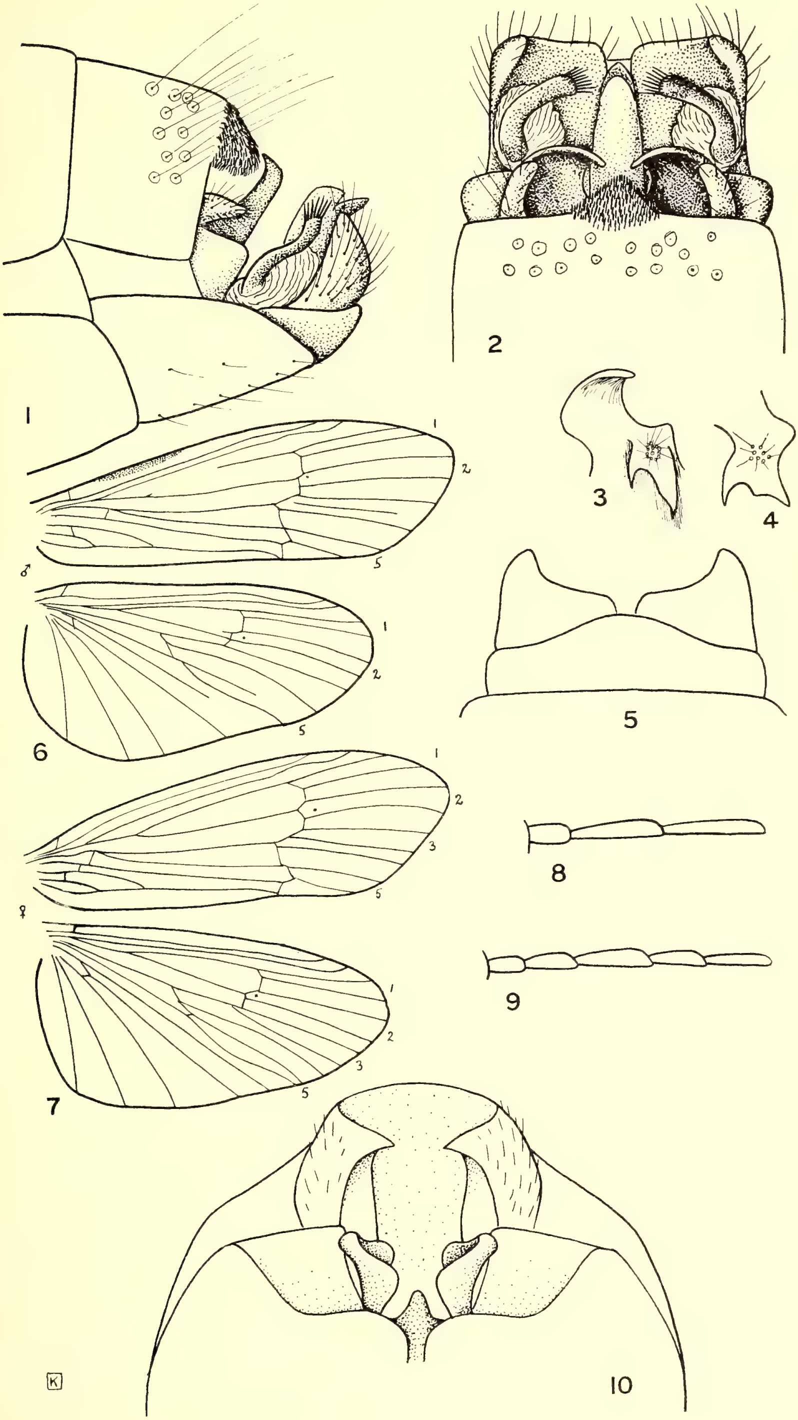
Pseudohalesus aberrans sp. n. (Pl. XI, figs. 1-10).

Head dark fulvous; ocelli white and rather prominent; antennae fulvous with paler annulations; palpi and legs pale fulvous. Anterior wings warm fulvous with yellowish irrorations more numerous in the post-costal region, membrane granulose, set with black erect hairs very long on the veins and closer together and more recumbent in the post-costal region so that the wing is considerably darkened in this area; in the ♂ there is a groove along the costa towards the base filled with specialised black hairs as indicated in the generic description; in this sex also the anterior wings in each example of a series of four, show varying aberrations in neuration but all agree in the absence of fork No. 3 which is absent also in the wings of one of the females represented but present in those of the other; other aberrations are too variable for description and consist mainly of broken nervures, in particular the sector so that in several examples (♂), the discoidal cell is only partially enclosed, the upper basal margin being wanting; membrane of the posterior wings weakly granulose with short but much less conspicuous black or brownish hairs than on the anterior wings. Fork No. 3 sometimes present, sometimes absent.

Genitalia ♂.—Margin of the eighth dorsal segment which is produced in a black tongue towards the centre, closely set with a mass of short black setae which form a mat, not only on the tongue but also over a considerable area beneath it; superior appendages from above, very small and narrow, curving slightly inward and fringed with long hairs; intermediate appendages somewhat complex and varying in detail in individuals; there is a pair of broad plates, as seen practically from behind, set side by side with the inner margins deeply concave so that between the two there is a nearly circular excision, inner apical angles slightly produced and turned over, from the side, directed upward; these plates form the bases for processes which are concealed by the dorsal segment and can only be seen directly from behind; they arise from towards the inner angles of the bases of the plates and are strongly chitinised and blackened; they vary in shape in individuals as indicated in the figures but agree in having small warts covered with long hairs at their bases; penis short and straight, sheaths membranous, no doubt extensile to judge by the creases in the membranes, apices set with long bristles; inferior appendages very broad, apices sinuous, nearly truncate, outer angles slightly produced.

Genitalia ♀.—The structure is only visible from directly behind; the ninth segment is produced at the centre of its lateral margins in two acute triangles directed inwards; below this is the vulvar scale with a pair of leaf-like, rather broad and sinuous lateral processes with a very small central lobe between. In both sexes the margin of each ventral segment carries a pair of nearly parallel rows of bristles separated from each other slightly towards their centres to enclose a narrow clear space (excepting the eighth where the bristles are closer together).

Length of anterior wing ♂ 10-12 mm.



Pseudohalesus aberrans sp.n., Fig. 1, genitalia ♂, lateral. Fig. 2, dorsal. Fig. 3, intermediate appendage, dorsal. Fig. 4, basal plate of the appendage from another specimen. Fig. 5, inferior appendages, etc., from beneath. Fig. 6, wings ♂. Fig. 7, wings ♀. Fig. 8, maxillary palpus ♂. Fig. 9, ♀. Fig. 10, genitalia ♀, ventral.

Length of anterior wing ♀ 11 mm.

Western Tibet; Kyam, about 15,500 ft., 19-25-vii-1932, C. E. Hutchinson, Yale North India Expedition.

Type ♂ in the British Museum collection, mounted in balsam, one pair of wings dry. Paratypes ♂ ♂, ♀ ♀ from the same locality in the British Museum and Yale University collections.

All the species of the series were found dead under stones. This is a strange insect and I can find no satisfactory variation in genitalia on which alone to separate the species from *P. kaschmirus* Martynov. Had I been confronted with a single example, I should unhesitatingly have considered it as merely an aberrant dwarfed form of this species. But having regard to the fact that Mr. Hutchinson obtained a series of no less than six examples, it is impossible to believe that in nearly all, a mere aberration could take the same form, i.e., the absence of fork No. 3 in both wings.

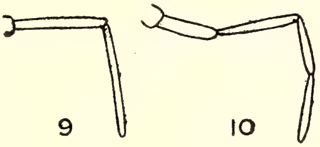
Halesinus Ulmer (Text-figs. 9-10).

Halesinus Ulmer.—Notes Leyden Mus., xxix, No. 1, pp. 3-4, fig. 3, 1907; Gen. Insect., fasc. 60a, pp. 57-8, Pl. V, fig. 38, 1907.

The genus *Halesinus* was erected by Ulmer to take a single ♀ species *tenuicornis* and the generic characters have been selected in accordance with the characters of this ♀. Subsequently Martynov described another ♀, *ussuriensis.*

The first ♂ to be recorded was found in the collection of the British Museum, from Tibet, and described by Martynov, in 1930, in the Proc. Zool. Soc. Lond., under the name *albipunctatus.*

Martynov described both sexes but does not figure the ♂ wings nor extend the generic description to cover this sex.



Figs. 9–10. *Halesinus albipunctatus* Mart., Fig. 9, maxillary palpus ♂. Fig. 10, maxillary palpus ♀.

When, for the purposes of this revision I found it necessary to prepare figures of the ♂ wings, it became apparent that the neuration of the ♂ is abnormal, and that the genus must be considered as exceptional as is the case with *Thamastes*, *Anomalopteryx* and *Enoicyla.*

The characters given below are based on those selected by Ulmer and refer to the ♀ sex alone, with the exception of the spurs which are 1, 3, 3 in both sexes.

Head very short and broad with a pair of transverse warts towards the back and a pair of small rounded warts between these and the lateral ocelli; antennae generally thin, as long as the anterior wing, the basal joint thicker and longer than the following ones and longer than the head; maxillary palpi very long and fine, first joint short, second equal to the fourth, the third somewhat longer, as long or even longer than the fifth; legs thin and long, with the spurs 1, 3, 3 inner spur slightly longer than the outer, spines black; first joint of the fore-tarsus as long as the second and third joints together. Anterior wing thickly clothed with hair and with the apex dilated, the apical border undulating so that the margin is concave in the fourth, fifth and sixth apical cells, the fringe at these points being comparatively long; neuration of the ♀ regular, forks Nos. 1, 2, 3 and 5 present; radius bent slightly before its extremity; discoidal cell very long and narrow, about three times as long as its foot-stalk, its upper and lower margins nearly straight; fourth apical cell closed by a straight nervure which is slightly longer than that of the second. Posterior wing only slightly broader than the forewing, discoidal cell much shorter than that of the forewing; only 8 apical veins present instead of the usual nine, the sixth apical vein being missing so that only forks Nos. 1, 2 and 5 are present; fourth apical cell as in the anterior wings.

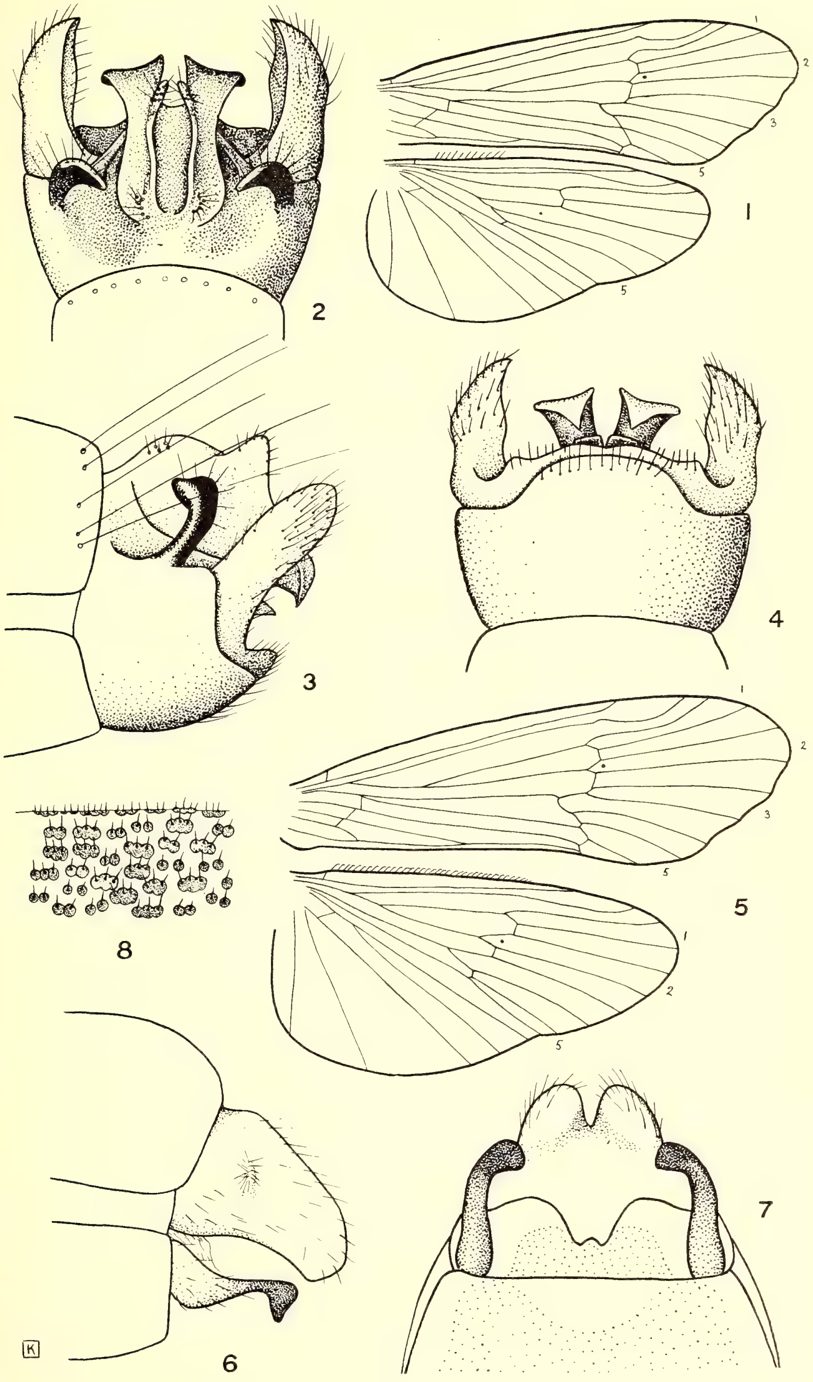
It may be added, with reference to the male, that in the posterior wing the discoidal cell is wanting, only fork No. 5 is present and that the first joint of the maxillary palpus is very minute. It cannot be made out at all in the type of *albipunctatus* in the British Museum, but Mr. Martynov (*in litt*) states that 'in the ♂ of *H. ussuriensis* there are three joints of which the basal is very short although distinct'.

Halesinus albipunctatus Mart. (Text-figs. 9-10; Pl. XII, figs. 1-8).

Halesinus albipunctatus Martynov.—Proc. Zool. Soc. Lond., Pt. I, No. 7, pp. 98-100, figs. 52-6, 1930.

Head black with slender black antennae; mesonotum black with the median impressed portion reddish-brown; metanotum dark brown. Maxillary palpi ♂ basal joint very short, second and third joints long and thin, approximately equal in length. Legs yellowish-brown; tarsi somewhat blackish externally. Anterior wing dilated towards the apex the margin of which is obliquely truncate, and distinctly undulating so that it is concave in the fourth, fifth and sixth apical cellules; membrane brown, clothed with blackish hairs; there are several pale yellow rounded spots particularly in the costal and sub-costal areas and two oblique pale spots between the cubitus and the hind margin and also two round yellowish spots at the arculus; fringe long with whitish spots here and there; discoidal cell long; posterior wing ♀ smoky, with a long discoidal cell; neuration of the male posterior wings abnormal as may be seen in the figure; there is a well-developed frenulum in both sexes, an unusual feature in the *Limnophilidae*.

Genitalia ♂.—Margin of the eighth dorsal segment fringed with long stout hairs; from above, beyond it is a large bifurcate dorsal plate with a narrowish cleft between the two forks, the sides of the cleft standing up in two sharp ridges of which the



Halesinus albipunctatus Mart., Fig. 1, wings ♂. Fig. 2, genitalia ♂, dorsal. Fig. 3, lateral. Fig. 4, ventral. Fig. 5, wings ♀. Fig. 6, genitalia ♀, lateral. Fig. 7, ventral. Fig. 8, portion of penultimate ventral segment ♀, enlarged.

distal ends are abruptly elevated in a pair of triangular processes; beyond the cleft, the plate slopes sharply downward and each fork terminates in a broadened truncate apex, apical angles projecting beyond the sides of the fork; on each side of the dorsal plate there is a large, strongly chitinised blackened curved hook, as seen from the side, directed upward with the apex slightly forward; penis retracted and difficult to make out; lower penis-cover broad, with excised apex which, seen from beneath appears as a pair of broad, shallow, truncated lobes; inferior appendages single-jointed; from the side, rather broad and straight, directed upward; from above, outer margins convex, inner straight or slightly sinuous, apices acute; from beneath, they are widely separated but connected at their bases by a strongly chitinised plate with a sinuous apical margin; margin of the ninth ventral segment strongly produced and rounded at its centre.

Genitalia ♀.—From above, the ninth dorsal segment terminates in two triangular processes separated from each other by a narrow cleft, each with a rounded wart at its base; from the side, they are very broad at the base, upper margins convex, lower sinuous, apices directed downwards; the margins of these processes and also the warts are rather densely fringed with long hairs; on each side of the central triangular processes are rather short, strongly chitinised caliper-like branches which, from beneath, terminate in clavate apices; from the side, each of these branches has the appearance of a duck's head, neck and shoulders directed downward; there is a ventral plate with a deeply cleft apical margin and a small central lobe, no doubt representing the vulvar scale; along the margin of the penultimate ventral segment there is a deep band of minute black setae arranged in groups of twos and threes to make a close pattern.

Length of anterior wing ♂ 11 mm.
Length of anterior wing ♀ 12 mm.
Tibet; Yatung, A. E. Hobson.
Type ♂ and 3 paratypes ♀♀ in the British Museum.

Platyphylax McLach.

Platyphylax McLach.—Journ. Linn. Soc. Zool., xi, p. 109, 1871; Rev. and Syn. Trich., p. 143, 1875; Ulmer.—Gen. Insect., fasc. 60a, pp. 53-4, 1907.

Spurs 1, 2, 2, ♂♀. First joint of the anterior tarsi long in both sexes. Palpi and legs slender (typically). Form of wings and general appearance much as in *Stenophylax* or *Halesus* (typically); anterior wings shining with scarcely any pubescence on the membrane (typically). Male with long up-directed inferior and broadly rounded superior appendages. The apex of the abdomen very obtuse, without appendages.

The above is McLachlan's description of the generic characters but he adds 'The Chinese *P. lanuginosus* and numerous North American species are widely divergent and in a general work on the species of the world it would be necessary to place them in several genera'.

Martynov's *rufescens*, a ♀, and the only described Indian species, hardly conforms to the generic characters, but until the Indian species of this genus are better known, particularly the males, it would be premature to extend the characters to cover this one case.

Genotype: *Platyphylax frauenfeldi* Brauer.

Platyphylax rufescens Martynov (Pl. XIII, figs. 1-5).

Platyphylax rufescens Martynov.—Proc. Zool. Soc. Lond., Pt. I, No. 7, pp. 105-6, figs. 64-6, 1930.

The type of this species is a ♀ of which Martynov's description is as follows:—

'Head and thorax yellowish-rufous with concolorous hairs. Antennae and palpi also yellowish-rufous. Legs yellow with few black spines; spurs yellowish-rufous 1, 2, 2. Anterior wings with parabolic apical margin, membrane finely granulose clothed with short yellowish hairs; fringe concolorous, yellowish without markings; post-costal area slightly brownish, irrorated with indistinct hyaline spots. Discoidal cell long, somewhat dilated at the end; first and third forks triangular, not deeply impinging inwards. Nervures pale testaceous. Posterior wings yellowish, sub-hyaline. Neuration resembling that in the anterior wings; fourth apical cell closed basally by an oblique nervure as in the anterior wings. Discoidal cell very long. Abdomen pale reddish-yellow, seventh, eighth and ninth segments brownish. Eighth segment normal, large; eighth sternite with a deep excision, side borders of which are sinuous; behind the sternite is small oval lobe and in the distal portion of the excision two minute lobules. Ninth segment small, reduced, more or less fused above with the tenth segment and with the superior appendages, but lateral portions better developed, subquadrate beneath, hairy; dorsal portion of the ninth segment with a median excision as far as the base. *Appendices superiores* fused with the tenth segment but their edges discernible above; from above they are broad at the base with oblique outer margins; hind margins excised and each sub-divided into two small lobes. Tenth segment (fused with the superior appendages) forming two long stick-shaped processes above and a transverse short plate beneath.

Length of body 10 mm. Expanse 27 mm.

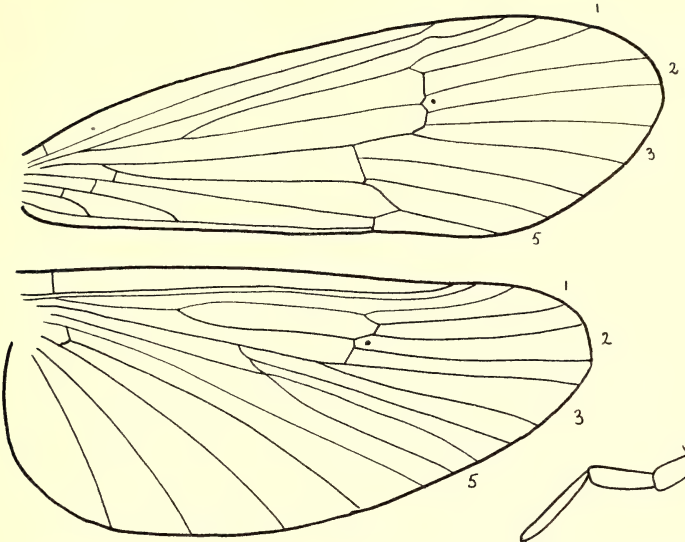
Tibet; Yatung, 4,500 ft., A. E. Hobson.

Type ♀ and paratype ♀ in the British Museum.'

Phylostenax Mosely.

Phylostenax Mosely.—Entom., lxviii, p. 184, 1935.

Insects large and brown, somewhat resembling *Pseudostenophylax* species but without the specialised scales of the posterior wing; anterior wing somewhat elongate, costal margin straight, apex only slightly dilated; in both wings second apical cellules very broad and forks No. 3 very acute at their bases; anterior wing, discoidal cell rather long and narrow, that of the posterior wing very broad at its distal end; shape somewhat different in



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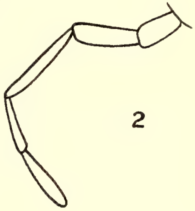

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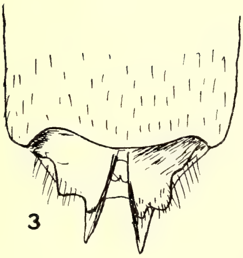

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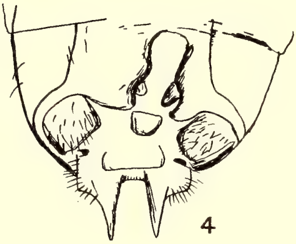

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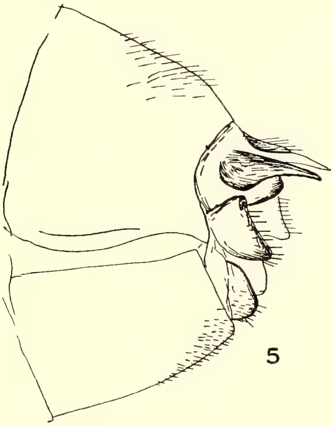

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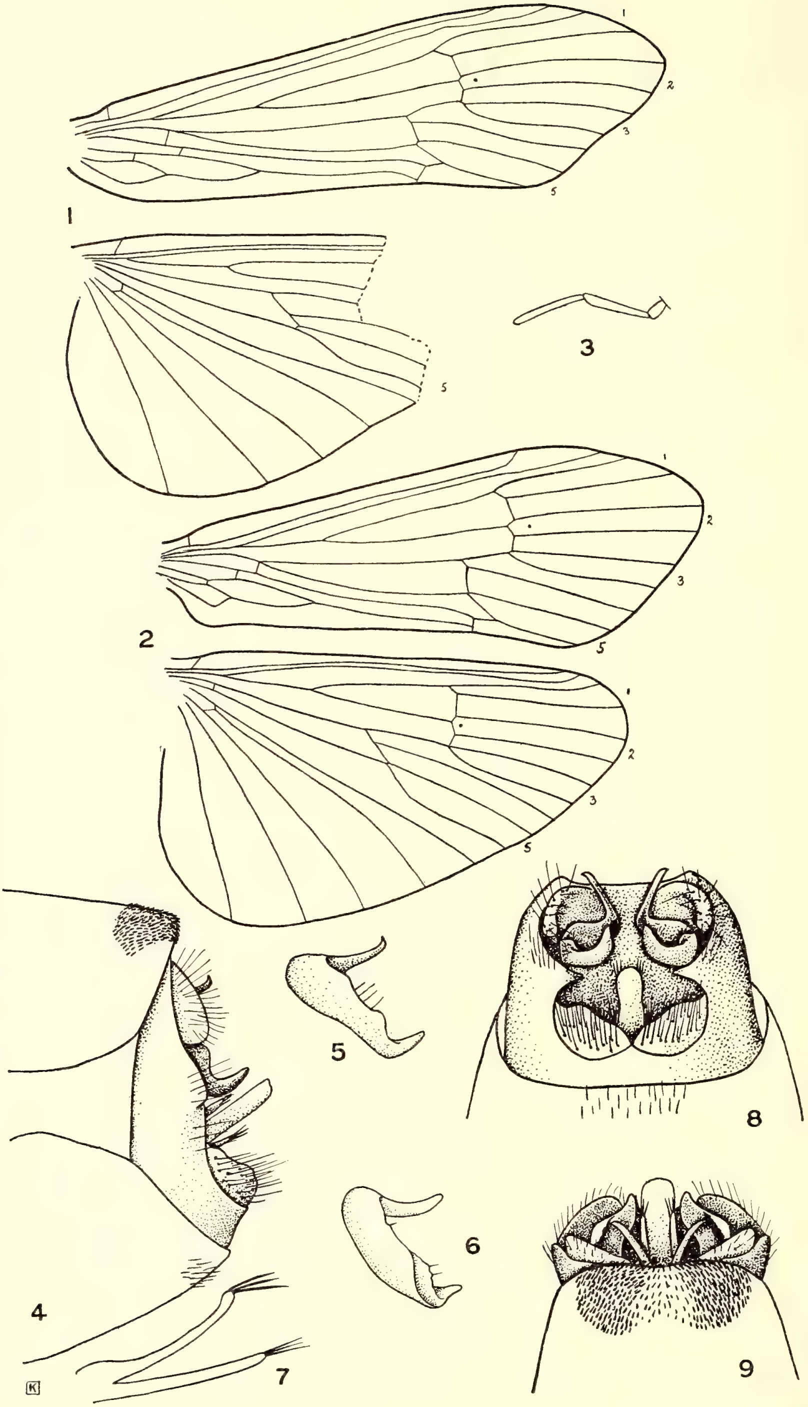
Platyphylax rufescens Mart., ♀. Fig. 1, wings. Fig. 2, maxillary palpus. Fig. 3, genitalia, dorsal. Fig. 4, ventral. Fig. 5, lateral (genitalia after Martynov).



Phylostenax himalus sp.n., ♂. Fig. 1, wings of type (Muktesar). Fig. 2, wings of a second specimen (Darjiling). Fig. 3, maxillary palpus. Fig. 4, genitalia, lateral. Fig. 5, intermediate appendage (Muktesar). Fig. 6, ditto (Darjiling). Fig. 7, a penis sheath, lateral (Darjiling). Fig. 8, genitalia, from beneath and behind. Fig. 9, genitalia, dorsal.

the example from Muktesar, but the wings in this insect are incomplete; membrane of the anterior wings scarcely granulose, brownish with numerous pale round irrorations; pubescence somewhat scanty but there is a mat of black hairs in each basal anal angle of the anterior wings.

Maxillary palpus male, first joint small, second and third long and approximately equal in length. Legs, terminal tarsal joints scantily furnished with black spines; genitalia, given in detail in the description of the genotype.

In the Muktesar insect the spurs are 1, 2, 2, but in the examples from Darjiling the legs are so broken that the spurs are uncertain. Three legs are gummed to the label, one showing three spurs, but these may perhaps have been detached from some other insect.

Genotype: *P. himalus* Mosely.

If the spurs alone were considered, *himalus* might perhaps be placed in *Platyphylax*, but McLachlan considered that the European species *P. frauenfeldi* was typical of the genus and that the ultra-European species would be better placed in other genera.

As I am also of opinion that the collection of many widely divergent forms of neuration and genitalia in one genus tends to confuse rather than simplify classification, I prefer to create a new genus rather than overload an existing one.

Phylostenax himalus Mosely (Pl. XIV, figs. 1-9).

Phylostenax himalus Mosely.—Entom., lxviii, p. 184, 1935.

General characters detailed in the generic description.

Genitalia ♂.—Margin of the eighth dorsal segment covered with small black setae which tend to group in two rounded masses towards the sides of the segment; superior appendages small and very wide, scarcely showing beyond the margin of the segment, from the side pear-shaped; the intermediate appendages are branched and the upper branches project beyond the margin of the segment, appearing as two divergent, rod-like processes; the lower branches are heavily chitinised and from above are rather widely separated, broad, inclining towards each other, apices wide and truncate, turned slightly upward with a strong ridge connecting the two apical angles; from beneath and slightly behind, they are strongly curved and direct upward; penis short and straight, furnished with a pair of forked sheaths whose apices are fringed with stiff bristles, the upper branch of each fork appearing above the penis and the lower, below; inferior appendages very small and wide, welded to the segment, on the eighth sternite, towards the centre is a tuft of fine spines.

Length of anterior wing ♂ 15 mm.

United Provinces; Kumaon, Muktesar, 7,000 ft., 24-iv-1923 to 15-v-1923, Fletcher coll.; Darjiling.

Type ♂ (Muktesar) in the collection of the British Museum. Paratypes, 2 ♂♂ Darjiling, in the collection of the Indian Museum, Calcutta.

The example from Muktesar differs slightly from the two examples from Darjiling both in the form of various parts of the genitalia and also in the neuration, particularly in the form of the base of the discoidal cell in the posterior wing, wings much broken in the Muktesar insect. These differences, however, do not in my opinion, warrant the separation of a second species. The spurs of the legs of the Darjiling examples are doubtful as the legs have been broken off and reattached, possibly mistakenly.

Anabolia Stephens.

Anabolia Stephens.—Ill. Brit. Ins., p. 229, *partim* 1837; McLach.—Rev. and Syn. Trich., p. 101, 1875; Ulmer.—Gen. Insect., fasc. 60a, p. 45, 1907.

Spurs 1, 3, 4, ♂ ♀. Anterior tarsi with the first joint long in both sexes. Antennae about the length of the wings, moderately stout. Anterior wings elongate, nearly unicolorous, fuscous, gradually, but not widely, dilated to the apex which is parabolic; discoidal cell and most of the apical cellules long; external basal cellule and ninth apical cellule short, the latter not extending to the anal angle; membrane scarcely granulose; no pterostigma. In the posterior wings, the fourth apical cellule at its base is as broad as the second, and is closed by an oblique nervule. Superior appendages of the ♂ very large; intermediate forming two long laterally-lanceolate blades; inferior short and cylindrical. Penis-sheaths furcate at the apex; penis slender, simple. No ventral teeth in either sex. In the ♀, the abdomen is very obtuse; ninth dorsal segment small; no appendages, but the tubular piece above forms broad sub-quadrate lobes.

I have given above McLachlan's description of the genus. The single Indian known species, *oculata*, has been described by Martynov and placed in *Anabolia*. I am unacquainted with the species and cannot say to what extent the neuration conforms with the above characters as the wings are not figured.

Anabolia oculata Martynov. (Text-figs. 11-13).

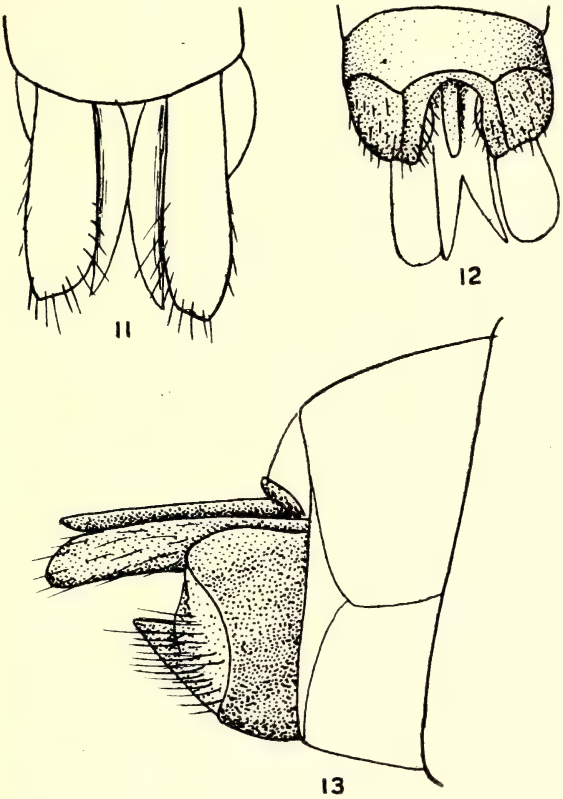
Anabolia oculata Mart.—Ann. Mus. Zool. Acad. Sci. St. Petersb., xiv, pp. 259-60, Pl. V, figs. 1-3, 1909.

Head, thorax and abdomen blackish fuscous; antennae black; maxillary palpi fuscous; coxae and femora black, anterior and median tibiae fuscous, tarsal joints testaceous, at the apex brownish; tibiae of the posterior pair proximally testaceous, distally fuscous; spines black. Anterior wings fuscous with some hyaline markings:

(*a*) a hyaline transverse spot at the base of second, third, fourth and fifth apical cells;
(*b*) a large irregular spot at the end of the thyridial cell and in the sub-discoidal area;
(*c*) a small transverse narrow spot before the pterostigma;
(*d*) a small spot at the end of the sixth apical cell;
(*e*) along the veins and on costal and post-costal areas there are small pale dots.

Neuration black; posterior wings sub-hyaline; the fourth apical cell at the base as broad as the second; cubitus furcate at the quarter beyond the level of the discoidal cell.

Genitalia ♂.—Superior appendages blackish; from the side, superior margin convex, inferior slightly concave; the apex slightly bent downwards; they are narrow, entire (not divided at the end); intermediate appendages (tenth segment) black, divergent and as long as in European species; side-pieces of the ninth ventral segment large, posterior margin impressed and covered with black hairs; inferior appendages forming a narrow margin along the edge of the ninth ventral segment (beneath), with ends produced somewhat triangularly (if seen from the side), all these anal parts blackish; penis not exserted.



Figs. 11–13. ***Anabolia oculata*** **Mart., ♂. Fig. 11, genitalia dorsal. Fig. 12, ventral. Fig. 13, lateral (after Martynov).**

Length of body 13 mm.; expanse 35 mm.

♂.—Tibet Orient; -vii-1901, Kozlov.

Stenophyliella gen. n.

Maxillary palpi ♂, first joint rather more than half the length of the second which is slightly shorter than the third. Antennae longer than the anterior wing, basal joint large, the second very short, about half the length of the following ones. Wings large, anterior brownish with faint yellowish annulations, membrane not granulose and covered with fine recumbent black hairs, apices considerably dilated. Posterior wings very broad; sub-hyaline, no scales in the anal region. Legs with spurs 1, 3, 4 and black spines but there are no spines on the terminal tarsal joint. Genitalia showing an affinity with those of the species of *Pseudostenophylax*.

Stenophyliella closely resembles the European genus *Stenophylax* and it is scarcely possible to find any substantial difference in neuration or the armature of the legs to separate them. But I am unwilling to place the single Indian known species in *Stenophylax* as this genus is already overloaded with incongruous forms and a far closer affinity is shown with Martynov's genus *Pseudostenophylax* although the scales on the posterior wings, which are a prominent feature of this genus is wanting.

Details of the genitalia appear in the specific description.

Genotype: *Stenophyliella kashmirensis* sp. n.

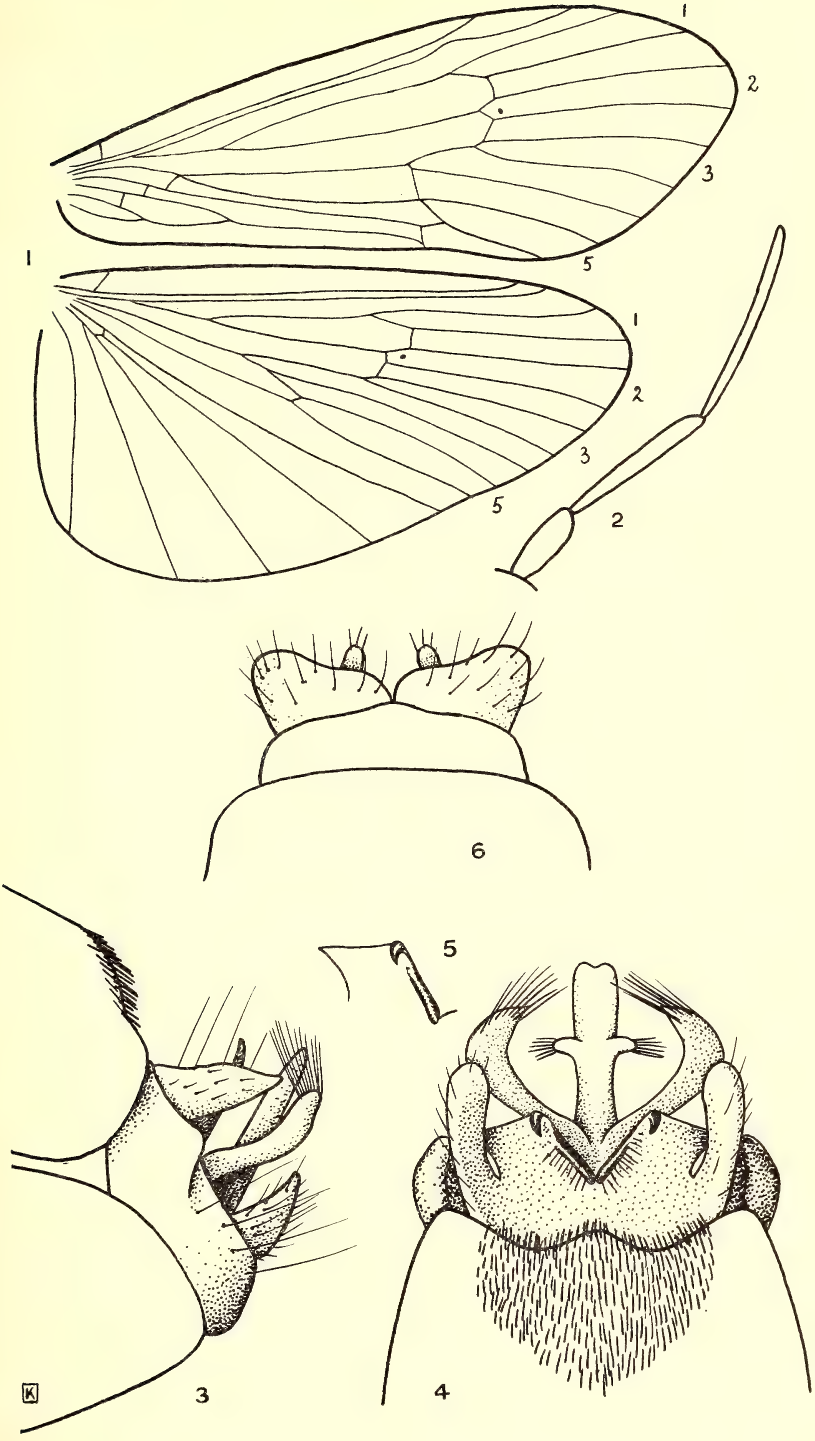
Stenophyliella kashmirensis sp. n. (Pl. XV, figs. 1-6).

The two examples of this species were collected in fluid by the late F. J. Mitchell and subsequently mounted in balsam. They are large insects, anterior wings brownish with faint yellow irrorations, apices considerably dilated, membrane set with short black setae between longer recumbent black hairs but scarcely granulose. Legs with spurs 1, 3, 4; no spines on the terminal tarsal joint.

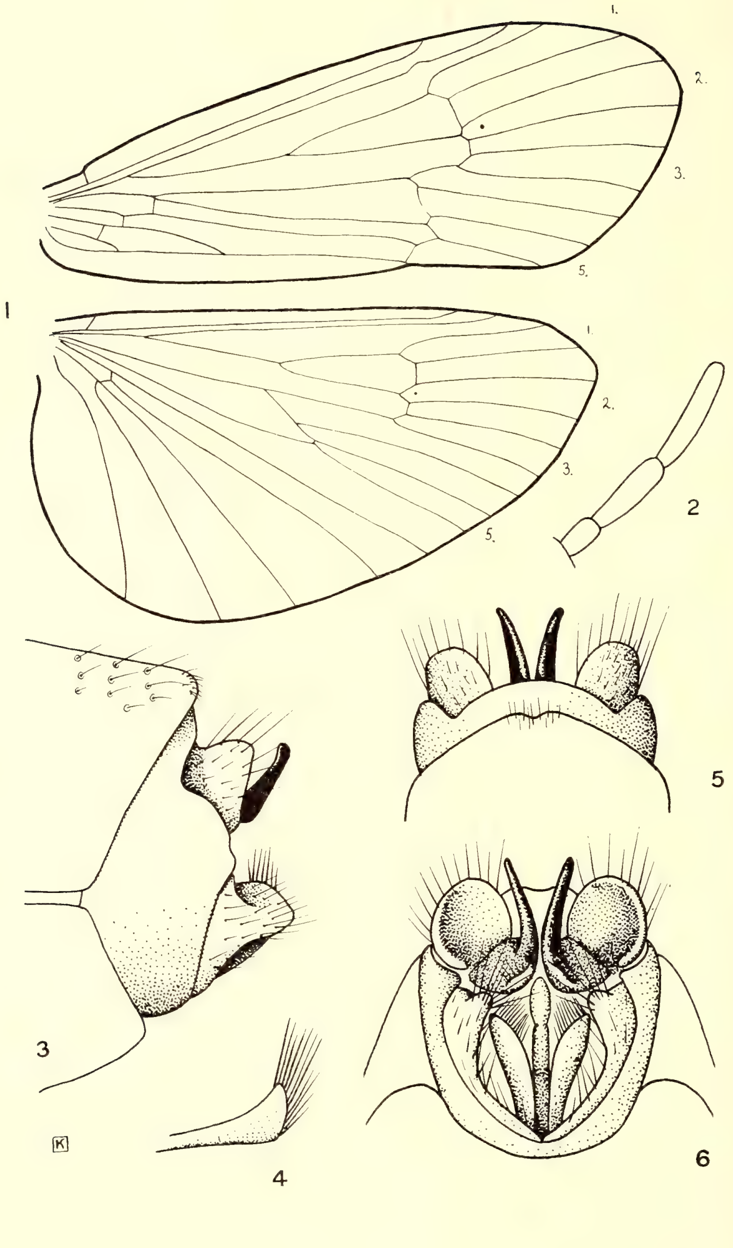
Genitalia ♂.—Margin of the eighth dorsal segment from above, slightly produced at its centre and covered with fine black setae; superior appendages from above and slightly behind, rather large, dilated at their apices; from the side, broad at the base tapering from about midway to acute apices; intermediate appendages from above and slightly behind, broad, apices truncate, with the inner angles turned upwards in acute blackened processes, the outer angles produced in broad triangular plates; the appendages are divided from each other by a wide triangular excision of which the margins are rolled over towards the base; from the side, the appendage appears as an upwardly directed blackened spur; penis straight, bearing two lateral processes about midway, one on each side making a cross, each furnished at its apex with long hairs, apex of the penis slightly excised; penis-sheaths appear as strong curving arms at the sides of the penis, caliper-shaped, apices curving inwards and furnished with bunches of bristles which meet inward across the penis, from the side they curve slightly upward; inferior appendages from the side narrow and pointed broader at the base; from beneath very broad, apices truncate or sinuous, each with a small blunt process towards its inner angle; ventrally the appendages nearly touch at their inner margins and are divided from each other by a narrow V-shaped excision.

Length of anterior wing ♂ 18 mm.

Kashmir, F. J. Mitchell.



Stenophyliella kashmirensis sp.n., ♂. Fig. 1, wings. Fig. 2, maxillary palpus. Fig. 3, genitalia, lateral. Fig. 4, dorsal. Fig. 5, intermediate appendage, dorsal. Fig. 6, inferior appendages, etc., ventral.



Astenophylina kashmirus sp.n., ♂. Fig. 1, wings. Fig. 2, maxillary palpus Fig. 3, genitalia, lateral. Fig. 4, penis sheath, lateral. Fig. 5, genitalia, dorsal. Fig. 6, from behind.

Type ♂ and paratype ♂ in the author's collection, both mounted in balsam.

Astenophylina gen. n.

Insects large and brownish, wings rather short and rounded, sub-costa joined to the radius by a cross vein; first apical sector in each wing curved at its base; second apical cellule very broad at its base; discoidal cell short and broad in each wing; surface of the wings not granulose or set with short stiff hairs. Maxillary palpi very short, no longer than the labial palpi, but possibly abnormal in the unique type; basal joint very short, second joint slightly shorter than the third. Legs, spurs 1, 3, 4; terminal tarsal joints furnished with black spines. Genitalia conforming with the *Pseudostenophylax* group in respect to the fringed penis-sheaths and small inferior appendages, but without the black setae bordering the margin of the eighth segment.

Astenophylina kashmirus sp. n. (Pl. XVI, figs. 1-6).

The unique type was collected in fluid and subsequently dried out and set; beyond that it is a brownish insect, it would hardly be safe to give a description of its general appearance; characters other than genitalia are noted in the generic description.

Genitalia ♂.—Margin of the eighth dorsal segment without any mat of black setae; in the unique type, the ninth segment is rather extruded, its dorsal margin rounded; superior appendages short and rounded, ear-shaped, fringed with long fine hairs, triangular from the side with a wide base; between them, from above, are the intermediate appendages which are narrow, strongly chitinised with approximate bases and widely divergent apices, from the side, directed upward; penis, from beneath, slender, with an ovate apex and two stout sheaths each broadened at its apex and with a produced upper angle as seen from the side; inferior appendages short and triangular, welded to the ninth segment, fringed with long black hairs; ninth ventral segment deeply excised with a large rounded excision.

Length of anterior wing 15 mm.

India; Kashmir, R. Arrah, F. J. Mitchell.

Type ♂ presented by the author to the British Museum.

Stenophylax (Allophylax) indicus Navás.

Stenophylax (*Allophylax*) *indicus* Navás.—Mem. Ac. Pont. Rome, (2) Nuov. Linc., iii, pp. 9-10, 1917.

I am unacquainted with this Darjiling species and therefore give the description as written by the author. No figures are given.

'Caput, palpi, antennae testaceae, pilis testaceis; ocellus plumbeis; oculi fuscis.

Thorax fusco-ferrugineus, pilis fuscis.

Abdomen testaceo-ferrugineum, pilis testaceis brevibus, sparsis; ultimo tergito ♂ denticulis nigris toto vestito, margine postico truncato; cercis superioribus brevibus, intermediis adscendentibus

acutis; copulatore exerto cylindrico; lamina subgenitali seu ultimo sternito in processum longum filiformen cylindricum producto. Pedes testacei, pilosi, nigro setosi, calcaribus 1, 3, 4 longis, fulvis.

Ala anterior in tertio apicali lata apice rotundata; margine externo obliquo; membrana tota minute granulata, leviter fusco tincta, pone procubitum usque ad marginem posticum densius fuscata; tota maculis sive guttis parvis rotundatis pallidis conspersa, in tertis posteriore distinctioribus; stria pallida ad thyridium; pubescentia brevi, fusca; fimbriis brevibus, fulvis; reticulatione fulvo-testacea; cellula discali, longissima, saltem quater longiora suo petiolo; furca apicali prima parum intra cellulam discalem penetrante. Ala posterior basi lata, apice parabolice rotundata; membrana tota minutissime granulata vel potius impresso-punctata, hyalina, levissime fulvo tincta, distinctus in tertio apicale; pubescentia fimbriisque fulvis; reticulatione fulvo testacea; cellula discali longa, bis vel ter longiore suo petiolo, furca apicale prima parum cellulam discalem penetrante.

	♂	♀
Long. corp.	14 mm.	13 mm.
Long. ala post.	18.5 mm.	17 mm.
Long. ala post.	15.5 mm.	14.7 mm.

Patria Asia. Darjeeling in montibus Himalaya 1910 (Coll. m.). Si formam cellulae discalis attendas haec species ad genus *Allophylax* Banks referenda; sed genus hoc mea sententia omittendum, quod charactere parum conspicuo et definito nitatur- videlicet cellulae discalis et furcae apicalis primae longitudine quae summopere variat.'

The presence of the genus *Stenophylax* Kol. in India requires confirmation, so I defer giving a description of the genus for the time being.

Apataniinae Ulmer.

Apataniinae Ulmer.—Ab. Natur. Ver. Hamb., xviii, pp. 42, 74, 1903.

The *Apataniinae* are separated from the *Limnophilinae* by the abnormal neuration of the anterior wing in which the sub-costa ends in a cross vein joining the radius and costal margin instead of continuing directly to the margin.

[1]The Indian fauna so far known contains only the two genera *Apataniana* and *Apatidea* separated as follows:

Table of Genera.

1. Discoidal cell of the posterior wing present. APATANIANA nov. gen. p. 475
—Discoidal cell of the posterior wing absent. APATIDEA McLach. p. 476

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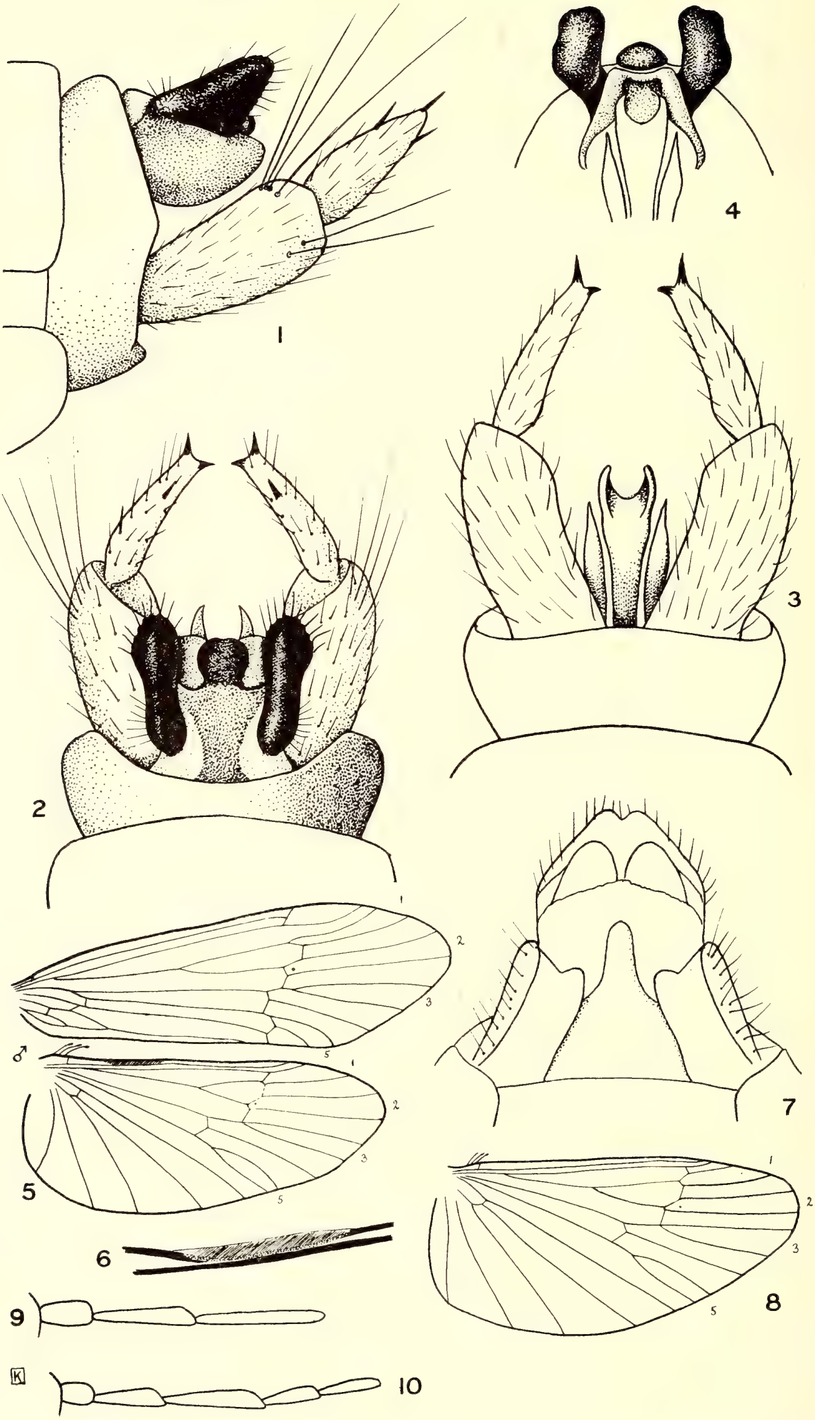
[1] Since this part was sent to press, a large collection has been received from Assam and Burma containing at least one new genus in this sub-family. A description will appear later on in a supplement.



Apataniana hutchinsoni sp.n. Fig. 1, genitalia ♂, lateral. Fig. 2, dorsal. Fig. 3, ventral. Fig. 4, apices of superior appendages and penis, etc., ventral. Fig. 5, wings ♂. Fig. 6, costal margin of posterior wing ♂, enlarged. Fig. 7, genitalia ♀, ventral. Fig. 8, posterior wing ♀. Fig. 9, maxillary palpus ♂. Fig. 10, maxillary palpus ♀.

Apataniana gen. n.

The genus has been erected to take the new species *hutchinsoni* in which the characters of neuration differ considerably from all other genera in the *Apataniinae*.

Maxillary palpi ♂, first joint about half the length of the second which is slightly shorter than the third; ♀, first joint less than half the length of the second, third joint almost as long as the first and second together, fourth joint slightly shorter than the fifth which is about twice the length of the first. Antennae slender, about the same length as the anterior wing; basal joint large, second short, remaining joints each longer than the second. Wings; anterior alike in both sexes; sub-costa running into a cross vein joining the costa to the radius, forks Nos. 1, 2, 3 and 5 present, discoidal cell closed, moderately long and narrow; posterior wings broader than the anterior, sub-costa parallel with the radius, construction differing in the sexes; in the ♂ there is a narrow fold or flap along the costal margin towards the base of the wing lined with coarse yellow hairs; this fold is wanting in the ♀; discoidal cell closed, forks Nos. 1, 2, 3 and 5 present; in the ♂, radius running into the first apical sector, first apical fork short and rather broad at the base, second as long as the third which is sessile, fifth short and with a distinct foot-stalk. Spurs 1, 2, 4.

Genotype: *Apataniana hutchinsoni* sp. n.

Apataniana hutchinsoni sp. n. (Pl. XVII, figs. 1-10).

Head dark fuscous with light honey-coloured hairs; palpi dark fuscous; antennae dark ochraceous with narrow black annulations; prothorax, mesothorax and metathorax black; legs ochraceous, spurs black, 1, 2, 4.

Wings, anterior greyish with honey-coloured hairs; whitish patches along the apical border between the apical sectors, posterior wings greyish, ♂ with a fold, filled with yellow hairs in the costal margin towards the base.

Neuration as shown in Pl. XVII, figs. 5-6, 8.

Genitalia ♂.—Margin of the ninth dorsal segment very broadly and shallowly excised; there are two short black superior appendages, apices somewhat dilated and serrate. Between them is a dorsal plate narrow at the base, broadening in two wide lateral triangular shelves; the apex of the dorsal plate is produced in a rounded blackened process; beneath this plate is a strongly chitinised arched structure, sides very deep and slightly inturned beneath; penis from beneath, narrow at the base, broadening to a widely excised apex; there is a pair of penis-sheaths, one on each side, rather shorter than the penis, inferior appendages two-jointed, basal joint very stout, terminal more slender, slightly shorter, apex armed with two or three short acute spurs; there is also a single spur on each joint slightly before the apex.

Genitalia ♀.—Beyond the terminal dorsal segment is a small penthouse-shaped process with a slight excision at the apex; from beneath there are two chitinous plates towards the apex;

below this is the long central lobe of the vulvar scale, the outer lobes being formed by the produced lateral margin of the terminal segment.

Length of anterior wing ♂ and ♀ 10 mm.

Western Tibet; Kyam, 19-25-vii-1932, G. E. Hutchinson, Yale North India Expedition, 7 ♂♂, 1 ♀.

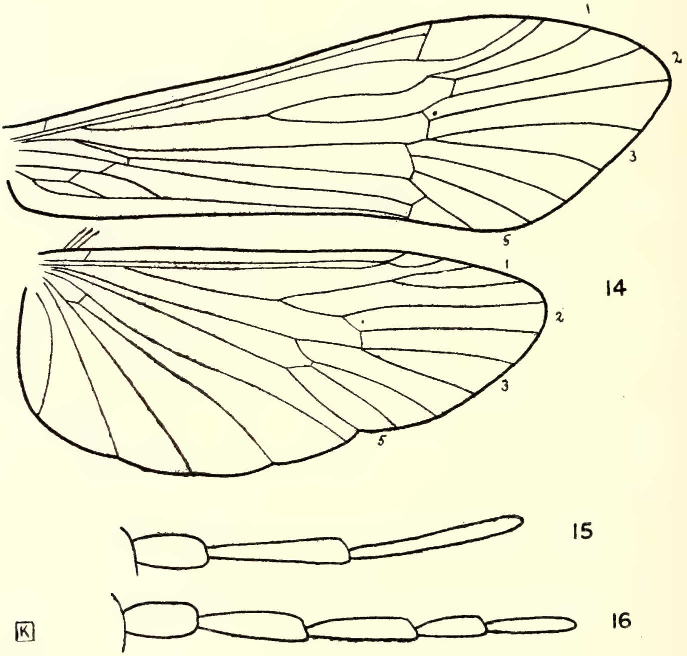
The collector, Dr. Hutchinson, to whom I have much pleasure in dedicating the species, states that the examples were all found under stones.

Type ♂ and paratypes ♂ and ♀ in the collection of the British Museum. Paratypes ♂ in the collection of the Yale University, U.S.A.

The genitalia of *hutchinsoni* closely resemble Martynov's figures of *Apatania bulbosa* which in the ♂ posterior wing also displays the narrow costal fold with the yellow hairs but in respect to other features of neuration, *bulbosa* is very abnormal.

Apatidea McLachlan (Text-figs. 14-16).

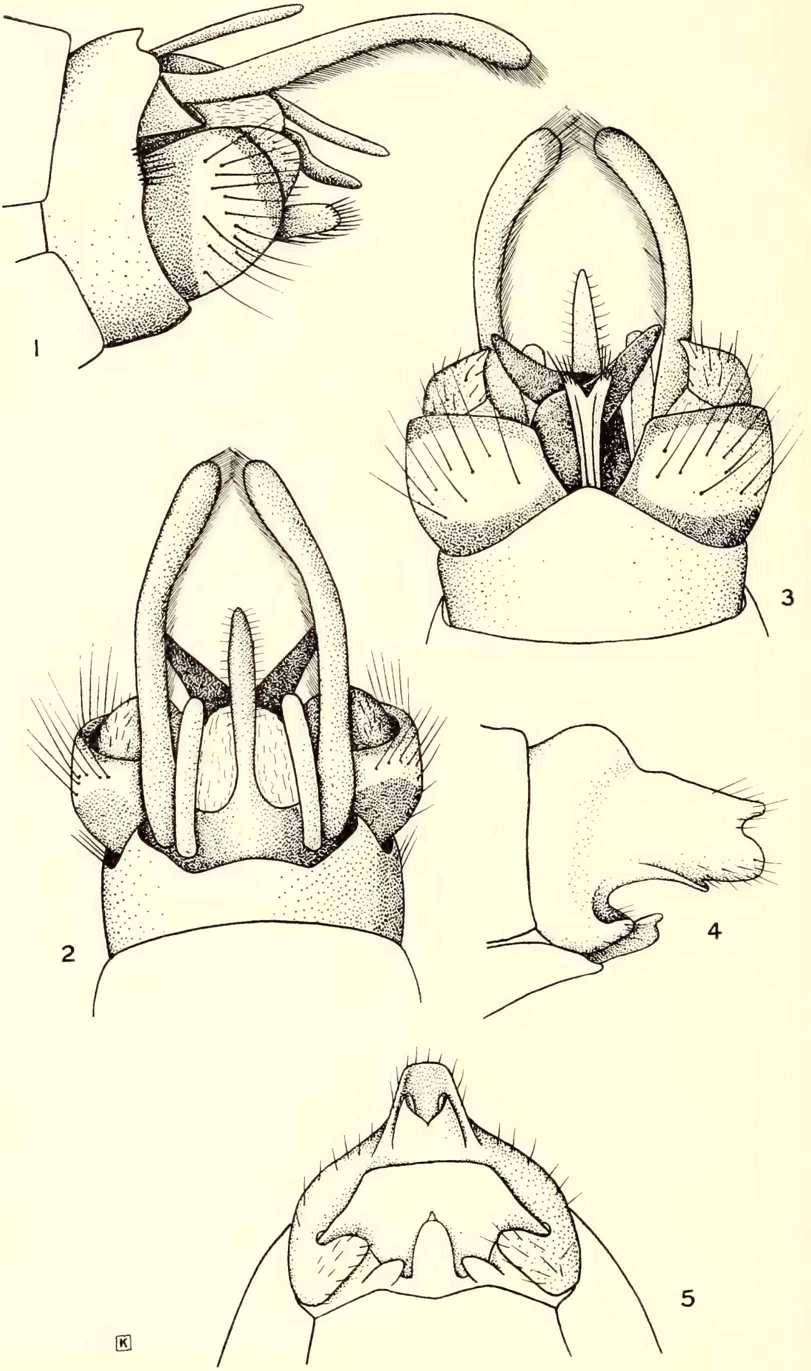
Apatidea McLach.—Rev. and Syn. Trich., p. 217, 1876.



Figs. 14–16. ***Apatidea brevis*** **sp.n., Fig. 14, wings ♂. Fig. 15, maxillary palpus ♂. Fig. 16, maxillary palpus ♀.**

Apatelia Wallengren, subgenus of *Apatania*.—Ent. Tidsk. Arg., 7, H. 2, p. 78, 1886; Skand. Neur.—Kongl. Sv. Vet.—Akad.

PLATE XVIII



Apatidea brevis sp.n. Fig. 1, genitalia ♂, lateral. Fig. 2, ♂, dorsal. Fig. 3, ♂, ventral. Fig. 4, genitalia ♀, lateral. Fig. 5, ventral.

Handl., Bd. 24, N. 010, p. 88, 1891; Martynov.—Ann. Mus. Zool. Ac. Sci., xxii, pp. 59, 63, 1918.

Maxillary palpi ♂, first joint about half the length of the second which is slightly shorter than the third; ♀, basal joint short, about two-thirds the length of the second, third equal to the second, fourth equal to the first and slightly shorter than the fifth. Antennae, basal joint large, the second very short, remaining joints each longer than the second. Anterior wing; the sub-costa ends abruptly in a transverse nervure joining the costa and radius; radius heavily-fringed with short thick hairs; discoidal cell long and narrow, upper margin slightly excised, first apical cell very acute at its base, second, third and fourth truncate, fifth with a minute foot-stalk. Posterior wing; the radius is arched towards its distal end to touch or nearly touch the sub-costa; sometimes not suddenly arched but confluent at a point towards the distal end, sometimes joined by a minute cross vein: lower margin of the wing slightly scalloped.

Spurs 1, 2, 2 or 1, 2, 4 ♂ and ♀.

Genotype: *Apatidea copiosa* McLach.

A few words are required in explanation of the synonymy. The sub-genus *Apatelia* was erected by Wallengren in 1886 to take the species *inornata* Wallengr. and *fimbriata* Pict. in both of which the radius and sub-costa are partly confluent in the posterior wing. In 1918 Martynov raised the sub-genus to full generic status. At the same time, he revised McLachlan's genus *Apatidea* in which two species had been described, *elongata* McLach. and *copiosa* McLach. placing the former in *Apatania* and the latter in *Apatelia* with the consequent entire disappearance of McLachlan's genus. In *copiosa*, the neuration of the posterior wing is similar to that of *fimbriata.*

Martynov in this transgressed the laws of priority, McLachlan's *Apatidea* having been erected ten years prior to *Apatelia* Wallengr. As neither McLachlan nor Wallengren selected genotypes of their respective genera, I here fix *copiosa* McLach. as the genotype of *Apatidea* McLach. 1876 and *fimbriata* Pict. as the genotype of *Apatelia* Wallengr. 1886, the latter genus thus becoming a synonym.

Apatidea brevis sp. n. (Text-figs. 14-16, Pl. XVIII, figs. 1-5).

Head and oculi black, particularly the oculi; palpi fuscous; antennae fuscous, no noticeable annulations; prothorax, mesothorax and metathorax dark fuscous. Wings, anterior castaneous posterior rather paler, for neuration, see text-fig. 14. Legs fuscous, spurs 1, 2, 4; abdomen castaneous, paler beneath.

Genitalia ♂.—The margin of the ninth dorsal segment widely excised with the central portion of the excision slightly produced and rounded, sides curling slightly under to make sockets from which arise the intermediate appendages; beyond it is a median process, wide at the base and produced in a long, slender, tailwardly and downwardly directed finger; on each side of this process are the superior appendages which are considerably shorter than the median process; intermediate appendages very long and strongly chitinised, heavily fringed, apices dilated and turned slightly downward; penis narrow, apex widely furcate, apex of each fork bearing two or three spines, beneath the penis are two long thin spines which are divergent so that they lie closely under the forks of the penis; penis-sheaths wide at their bases which cross, one over the other so that the narrower apices are widely divergent; inferior appendages two-jointed, basal joint short, very stout and round, terminal joint turned in and rather pointed.

Genitalia ♀.—From beneath, tubular piece narrow, central lobe of the vulvar scale broad and long, from the side, very deep, upper margin produced to make a small finger; side lobes very short and rounded; there is a broad, transparent sub-genital plate welded beneath to the tubular piece which, from the side is widely cleft.

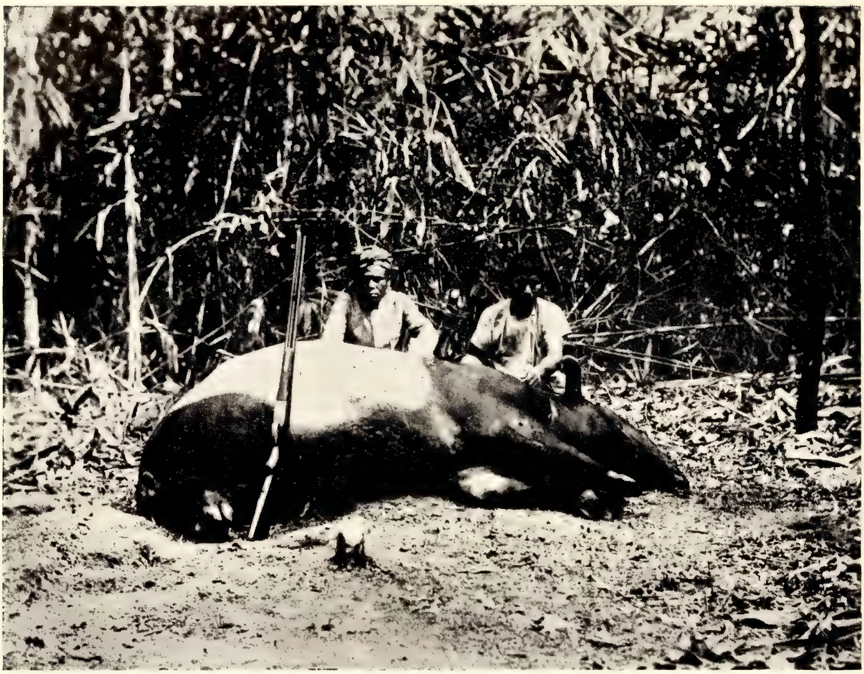
Length of anterior wing ♂ 5.5-10 mm.; ♀ 8-10 mm.

Kashmir; Gagirbal, 5,190 ft., F. J. Mitchell, numerous ♂♂ and ♀♀; Killanmarg, 10,500 ft., 13-vii-1931, Fletcher Coll., 2 ♂♂, 19-22-vii-1923, Fletcher Coll., 1 ♂.

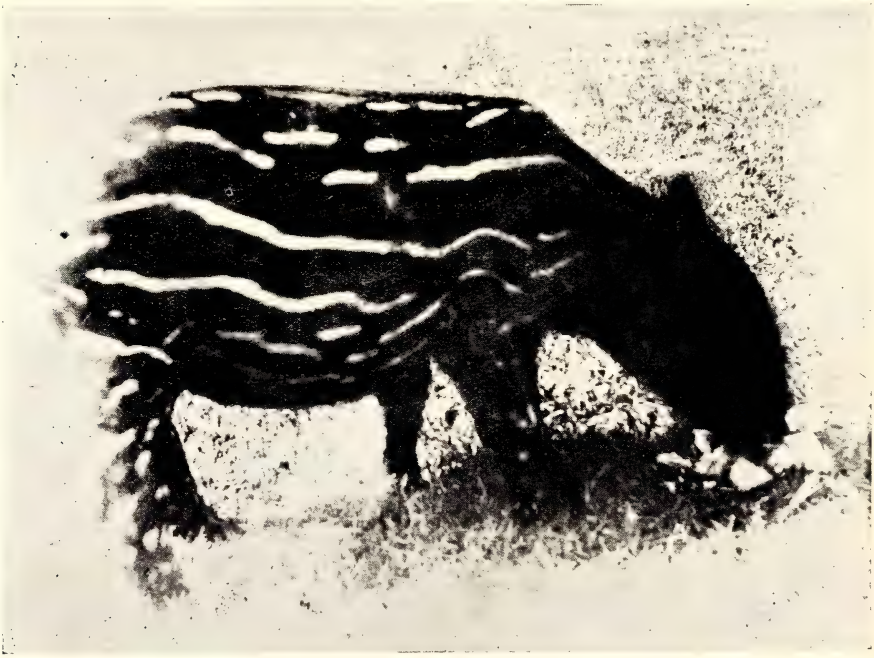
Type ♂ (Gagirbal) in the author's collection; paratypes ♂ and ♀, details as above, in the author's and the British Museum collections.

The species is very variable in size, the dimunitive ♂ with a 5.5 mm. wing being recorded from Kashmir, Killanmarg, 10.500 ft., the larger from Kashmir, Gagirbal, at 5,190 ft. *Brevis* bears a close resemblance to the Turkestan species *Apatidea copiosa* McL. but differs in the arrangement of spurs and in the length of the superior appendages which, in *copiosa*, are longer instead of shorter than the median process.

(*To be continued*).



Tapir shot by the author.



Young tapir caught by the author after its mother was shot in Tavoy.

THE MALAY TAPIR (*TAPIRUS INDICUS*).

BY

W. S. THOM.

(*With one plate*).

The Burmese call the tapir *Kyan-thu-daw*. I have never heard it called *Tarashu*. *Tarashu* does not appear to me to be a Burmese name although it is mentioned in the *Fauna of British India*, and in E. H. Peacock's book *A Game Book for Burma*. The name may be peculiar to Tavoy or Mergui where alone in Burma this animal is found, and where true Burmese is not spoken.

The tapirs, rhinoceroses, horses and wild asses, are included in the Perissodactyle or Three-toed Ungulates. Five species of tapirs are known to exist: of these four are confined to Central and South America; while the fifth is an inhabitant of the Oriental region, where it is found only in Lower Burma, the Malay Peninsula and Sumatra. The fact that tapirs are now found in limited areas separated by many thousands of miles from each other provides a good instance of the rare phenomenon of 'Discontinuous Distribution'. We know that in past geological epochs tapirs were abundant over a large portion of the Earth's surface. Their fossil remains have been dug up in many European countries. One explanation is that the tapirs were once prevalent in the northern countries. Owing to changes of climate and other conditions which are not very clear, they migrated southwards, and the existing tapirs now found in the Malay countries and America are the descendants of these emigrants. Or it may be that tapirs were once continuously distributed over the Earth's surface from north to south, that they ceased to exist in the northern countries and we have now only to deal with the few scattered remnants of what was once a widely distributed tribe.

The Malay Tapir, which is the largest of the group, is readily distinguished from all its South American cousins by the parti-coloured hide of the adult; the head, limbs, and front part of the body being dark brown or black, while all that portion of the body situated behind the shoulders including the rump, and the upper part of the thighs, together with the tips of the ears, are greyish white, or white in the adult. In very young animals on the other hand, that is to say those not exceeding from four to six months in age, the ground colour is blackish-brown or black marked (as in the young of the American species), with longitudinal streaks of yellow on the under parts. The hair too is markedly denser than in the full-grown animal. In height an adult tapir stands from three to three and a half feet at the withers and about four inches more at the rump; the length from the tip of the snout to the root of the tail measured along the curves of the body being about eight feet.

Its habits are in all probability very similar to those of the American representatives of the genus. Like the rhinoceros, tapirs love wallowing in water and in mud holes in the deepest recesses of the jungle. Another habit common to tapirs and some rhinoceros is that their droppings are sometimes found in large heaps. They also browse on twigs and leaves like rhinoceros. All tapirs are extremely shy and retiring animals dwelling amid thick jungle in the neighbourhood of water to which they take readily. They are easily tamed and make very docile pets, following one about like a dog. A young one was caught in Tavoy, Lower Burma, 26 years or so ago and presented to Major Reid, a one time Deputy Commissioner of Tavoy. This animal was, if I mistake not, subsequently given to Colonel King, I.M.S., Burma, who presented it to the Maharajah of Mysore, India. I wonder if it is still alive. These animals are generally nocturnal in their habits. Their sense of sight, smell, and hearing is very acute. I should say that their sense of scent was equal to that of any deer, elephant, wild cattle, thakin, or rhinoceros. I would also go as far as to say that their sense of sight is more acute than that of any animal to be found in the jungles of Burma. I have tracked up and followed tapir on many occasions accompanied by only one experienced Burman hunter, and although we could both cover the ground as noiselessly as cats, the animals invariably stampeded before we came up with them and made off at a lumbering gallop uttering a succession of squeaks and snorts. My intention on those occasions was not to shoot the animals but to study their habits and also to get a photograph. These animals are rarely met with during the day unless they are tracked up to their resting places and wallows or are driven out of their haunts by the larger felines or by beaters. They usually inhabit low-lying, flat, damp, swampy ever-green forests, but in Tavoy I have also come across them in jungle in close proximity to villages. They are, if I am not mistaken, never found in hilly country so far as Burma is concerned. I do not suppose any sportsman in Burma has seen as many tapir in their wild state as I have over a period of about two years. It may be thought that being such shy and timid animals they would be found far away from human habitations, but I have found their tracks in dorian and jackfruit gardens adjacent to villages. In the *Bombay Natural History Society's Journal*, vol. xx, No. 2, dated the 18th October 1910, p. 515, Mr. J. B. Mercer-Adam, F.C.H., of the Forests stated that a Burman of Kado village, Moulmein, had seen a tapir in his garden in the evening. The Burman although he did not recognize it as a tapir described it as a very large pig, half black and half white. Both tapir and rhinoceros revel in a country where the forests are dense and where the rainfall is heavy. Tapir never inhabit the high mountainous country frequented by the Sumatran rhinoceros (*R. sumatrensis*).

The Malay Tapir, which like rhinoceros is now entirely protected, offers little attraction to a European sportsman since it yields nothing in the way of a trophy except the skull, skin and hoofs, and it is not given to charging or attacking human beings.

No European, Burman, Indian, or Karen hunter seeks to kill or catch tapir unless it be to capture a young for sale to some Indian prince or zoo; as their blood, unlike the two species of rhinoceros found in Burma, viz. *R. sumatrensis* and *R. sondaicus*, appears to possess no valuable properties. Any animal captured alive would of course belong to the Forest Department as it would come under the nomenclature of forest produce. A good many of these animals were trapped in pits and nets during beats in the bad old days for food principally, not only in Burma but in the Malay States. The residents of the two districts of Tavoy and Mergui however consider it a sin to kill a tapir; because, as the legend has it and as its Burmese name, *Kyan-thu-daw*, seems to imply, the animal is considered to be holy and more or less sacred because periodically about the full and new moon it visits the nearest salt-lick or hot sulphur springs of mineral and saline mud in the vicinity of its haunts as if to go into retreat, or to make as it were its orisons. The word *Kyan-thu-daw* literally translated would mean *Kyan* a rhinoceros and *thu-daw*, a person devoted to the service of religion, or in other words the worshipping or holy tapir; although why they should prefix the word '*Kyan*' before the *thu-daw* I am unable to say. It may perhaps be because the shape of the animal's foot is not unlike that of a rhinoceros. Indeed, in the old days, newcomers when out after game in the Tavoy and Mergui districts often mistook the tracks of a tapir for those of a small rhinoceros. Rhinoceros as a matter of fact visit salt-licks at regular intervals, once or twice a month with the new and the full moon as do tapir, and perhaps the Tavoyans and Merguians consider the tapir to be a religious attendant or follower of the rhinoceros; hence the name *Kyan-thu-daw*.

The first and only tapir bagged by me was in the Tavoy District. It was at a place called Mijyaunghlaung (the resort of crocodiles), where a magnificent morass of hot bubbling sulphur springs of mineral water and mud may be found situated in the heart of virgin tree, bamboo and cane forest, a veritable health resort of all wild animals who partake of the mud and waters in order to rid themselves of internal parasitic worms. As a matter of fact I was not out after tapir at the time but after 'tsaing' or banting (*Bibos banting birmanicus*) and bison (*B. gaurus*).

The water and mud in this morass or swamp was so hot that one could not walk in it bare-footed. The surface was pitted with the tracks of elephant, bison, tapir, sambar, hog deer and 'tsaing', I heard the lumbering galloping sounds of the tapir's hoofs approaching, so unlike those of any other animal, excepting perhaps the buffalo and the rhinoceros. It was conjectured that it must be one or other of these and not a female tapir with a young one. It was all over in a few seconds. The jungle was dark and gloomy and objects were not easily discernible; the animal consequently as she galloped past received before it was known what manner of beast she was, a right and a left behind the shoulder from a 12-bore 'Cosmos' ball and shot gun, which brought her to the ground with a crash into a nullah 150 yards further on, shot through both lungs. The young one which appeared in view some 50 yards or so behind its mother after I had fired at the latter, was captured after a short struggle and kept alive for a period of about a month when it succumbed to shock and blood poisoning in spite of every attention and a liberal use of antiseptics, as it was found that both it and her dam had been badly mauled either by a leopard, wild dogs, or a tiger. Probably it was a leopard that had attacked them with the object of making a meal of one or both; but had been frustrated in the attempt. The young one became so tame before its death that it used to follow me about when I called it, and eat plantains and jackfruit and the leaves of the latter tree from my hands.

The tapir has no means of defending itself with the exception of the kicking power of the hind legs which are not however propelled with sufficient force to be of much use as a means of defence sufficient to ward off an attack from the 'felidae' and wild dogs, their only enemies besides Man. The shape and position of the snout of the animal also makes any attempt at using its teeth with any great hope of success, well nigh impossible. If the hind legs could be used with the rapidity and force employed, shall we say, by an ostrich, horse, elephant, bison or even a mule, it might have some chance of holding its own. It is probably due to the tapir's acute sense of smell, sight and hearing that it is saved from early extinction. Its snout, like the trunk of an elephant, is extremely sensitive to pain and a struggle between a tapir and either a leopard, tiger or a pack of wild dogs would invariably end in the death of the tapir. The feet or hoofs make excellent trophies if properly mounted by a good taxidermist. I have all four feet of the only tapir shot by me beautifully mounted by Messrs. Rowland Ward, two of them as spirit cheroot lighters, one as a call bell, and the fourth as an inkstand. The flesh of the tapir although coarse is palatable enough and not unlike that of rhinoceros meat, but neither animal is sought after on account of its meat. The people moreover believe that the consumption of tapir flesh tends to cause leprosy which of course is a fallacy like many other of their beliefs.

Before ending my article on Tapir I would like to quote here a few extracts from an article which was published in the *Rangoon Gazette* of August 1935 by a correspondent of that paper, and which seems to me very apt. 'Nature', he says, 'is capable of surprises and even jests that upset our pre-conceived notions and theories, and not the least remarkable of these surprises is the tapir described by Mr. H. C. Smith, Honorary Game Warden of Burma, in his series on the wild animals of Burma'.

'When we think of wild animals we instinctively divine the thought further with recollections of animals we have read or heard or seen in zoos and films, we have had witness of the ferocity of the tiger and the lion; there is a smile for the antics of the monkey tribe, or for the ungainly absurdity of the rhinoceros on his stumpy legs; and there is wonder and delight at the swift grace of the deer and antelope tribes. But what shall we say of the tapir? It is a perpetual refutation of the general application of theories on the struggle for existence. It is a shy and mild and gentle creature. It is easily tamed in captivity. It is nothing much to look at and its white overcoat is an amusing vagary of jungle fashion. The female is bigger than the male. A small shrill squeal is the only sound recorded in connection with the animal. It likes water and is credited by some with the extraordinary power of walking along the bottom of deep pools instead of swimming. It wanders silently and unobtrusively in the densest evergreen. It is not poached, the jungle people regarding it as is the fate of many philosophers living out of their time with "almost amused contempt". And the tigers do not seem to kill it. It is, as Mr. H. C. Smith remarks, a harmless and interesting animal. The tapir is in fact an enigma. It may be a survivor of some more gentle and legendary time, or it may be wandering in unique isolation in a world not yet mature enough for its wisdom. We should therefore cherish and protect the tapir, just as so many of the wild animals of Burma should be protected in case they are exterminated.'

Alas I am afraid I must plead guilty to having shot one of these inoffensive animals under rather peculiar circumstances in the Tavoy District many years ago, in the year 1909 to be exact, i.e., some twenty-six years ago. I wrote an account of this animal's death at the time and also described the tapir and its habits in detail. This appeared in a number of the *Asian* sporting paper which has now been defunct for many years.

These reminiscences of mine are after all of days gone by when much game was shot by sportsmen. This is a new age of licenses, game laws and protection. The old days are gone never to return.

THE ORNITHOLOGY OF TRAVANCORE AND COCHIN.

BY

SĀLIM ALI.

With Notes by HUGH WHISTLER.

PART IV.

(*Continued from page* 320 *of this volume*).

FAMILY: SYLVIIDÆ.

Acrocephalus stentorius brunnescens (Jerdon). The Indian Great Reed-Warbler.

Specimens collected: 286 ♀, 287 ♂ 15-2-33 Kottāyam S.L.; 422 ♂ 7-3-33 Kūmili 3,000 ft.; 1041 ♂, 1042 ♀ 30-12-33, 1052 ♂ 31-12-33 Karūpadanna ca. S.L.

Elsewhere noted at: Vembanād Lake (Trivandrum Environs).

Colours of bare parts: Iris hazel to olive-brown; bill, upper mandible excluding commissure horny-brown, commissure and lower mandible pale flesh colour, horny at tip; mouth bright orange-brick colour; legs and feet horny-grey or pale plumbeous; claws duskier.

[The Survey specimens measure:

	Bill.	Wing.	Tail.	Tarsus.
4 ♂♂	24.5-26.5	87-94	76-84.5	27.5-29.5 mm.
2 ♀♀	25.5-26	85-90	76-79	28 mm.

Additional specimen from Travancore examined:

Brit. Mus. Coll.: ♀ 26-4-1910 Thodupuzha (Nair).

In *J.B.N.H.S.*, vol. xxxv, p. 450, I threw doubt on the validity of the resident breeding race in Ceylon *A. s. meridionalis* (Legge), as the two specimens in the British Museum did not appear to me to be separable. Owing to the courtesy of the Director of the Colombo Museum I have examined four more specimens from Ceylon. Two of them are undated and one unsexed, whilst one of the others is very worn, but the series, so far as it goes, makes me more prone to accept the probability of a small and very dark Cinghalese race. Further material is required to settle the point, as although Mr. Stuart Baker (*Nidification*, ii, 356) accepts it, he considers it intermediate in character between *brunnescens* and his race *amyae*. The probability that true *brunnescens* reaches Ceylon as a winter visitor, living then alongside a resident separable race, must also be borne in mind.

In the *New Fauna*, ii, p. 388, the genus *Acrocephalus* is said to undergo a complete moult both in autumn and spring; and it appears to be certainly correct that there are complete moults in spring and autumn in the closely allied *Acrocephalus arundinaceus* (vide *Practical Handbook of British Birds*, i, 335). After examining a very large number of *A. s. brunnescens* I can however only come to the conclusion that there is no spring moult. The complete post-nuptial moult takes place from September to November. So far as I can ascertain the post-juvenal moult is complete.

In fresh autumn plumage this form is distinctly washed with grey on the upper parts, more particularly on the crown and hindneck. With wear in summer the colour becomes much duller and browner.—H. W.]

There is nothing on record to show the status of the Indian Great Reed-Warbler in Travancore and Cochin. The latest date on which the Travancore Survey came across it was 7 March among scrub and bushes on a seepage marsh by the margin of Periyār Lake. The birds were common there at that time, but whether it is a resident species or not is doubtful. They were also abundant amongst the densely shrubbed bunds or dykes in the backwaters (consisting of *Pandanus* and clumps of tall coarse grass) where the birds hopped about in the undergrowth, occasionally clambering up into the overhanging fronds of cocoanut palms. It frequented similar environment at Karūpadanna and about the Vembanād Lake. Specimen No. 1052 was a solitary bird obtained among bushes growing on a spit of dry sand on the sea-shore.

Besides the loud, harsh and often ventriloquistic song of the male which is uttered from exposed perches on bushes and the like, it has a harsh, single '*Ke*' like *Turdoides*, uttered every few seconds and also a '*chr-r, chr-r*', etc. similar to but much louder than that of the more familiar Blyth's Reed-Warbler.

Breeding: The gonads of the specimens were in an undeveloped condition. No. 1042 (30 December) was immature with two imperfectly ossified patches on the anterior part of the skull. No record of its breeding in this area exists, though it is not inconceivable that it may do so about the backwaters.

Acrocephalus dumetorum Blyth's Reed Warbler.

Specimens collected: 69 ♀ 12-1-33, 96 ♀ 14-1-33 Marāiyūr 3,500 ft.; 113 o? 19-1-33 Mūnnār 5,000 ft.; 148 ♀, 149 ♀ 25-1-33 Sānthanpāra 3,500 ft.; 210 ♂ 4-2-33 Thattākād 200 ft.; 324 ♀ 21-2-33, 342 ♀, 343 o? 23-2-33, 360 ♂ 25-2-33 Peermade 3,200 ft.; 396 ♀ 3-3-33 Kūmili 3,000 ft.; 554 o? 10-4-33, 562 o? 11-4-33 Cape Comorin ca. S.L.; 960 o? Nemmāra 300 ft.

Elsewhere noted at: Kottāyam (ca. S.L.); Wūndamet; Rājampāra (1,350 ft.); Tenmalāi (500 ft.); Kūriārkūtti (1,600 ft.); Wadakkāncheri (400 ft.); Pādagiri (3,000 ft.—Nelliampathy Hills).

Colours of bare parts: Iris hazel-brown (dark straw colour in one); bill, upper mandible horny-brown; lower mandible pale flesh colour; mouth orange-yellow or pale pinkish-yellow; legs, feet and claws greyish flesh colour; soles pale yellow. In the albino (No. 210): Iris olive-brown; bill pinkish flesh colour slightly brown on upper mandible; mouth orange-yellow; legs, feet and claws yellowish flesh colour.

[Additional specimens examined:

B. M. Coll.: ♀ 7-4-07 Manthukuly [Mūthūkūzhi ?], Travancore (Nair); ♂ 6-2-80 Mynall (Bourdillon); o? 7-3-77 Mynall (Hume Coll.).

Measurements:

	Bill.	Wing.	Tail.
1 ♂	17	63.5	53 mm.
6 ♀♀	16-18	60-62.5	51.5-54.5 mm.

This common migrant arrives in India in worn breeding dress and the complete moult takes place from August to November, mostly in September and October. The spring moult, which I think is confined to the chin, throat and breast, is late, taking place about April and May. The upper plumage becomes much duller and browner by wear.

Some juveniles arrive in India before the post-juvenal moult. They may be distinguished, in addition to the softer character of the plumage, by being a more rusty-brown above, especially on the rump and upper tail coverts (thereby recalling *Acrocephalus scirpaceus*) and on the edgings of the wings and tail, the quill feathers being altogether duller and washed with this colour; the underparts are slightly paler.

I suggest that the post-juvenal moult is usually complete, but that some individuals do not moult the primaries, primary coverts, secondaries and greater coverts or the tail.—H. W.]

Blyth's Reed-Warbler is a common winter visitor to Travancore and Cochin. A marked decrease in its numbers was observed by the beginning of April. The last date on which the Survey came across it and obtained a specimen was 11 April, by which time most birds had departed. This specimen was very fat also, suggesting that it was ready to emigrate.

In the cold weather it is a common species in hills and plains alike, frequenting scrub country, hedges and brushwood. At Pādagiri (3,000 ft.) in the Nelliampathies it was particularly abundant in the dense bracken thickets on water-logged patches along the hillstreams, commonly in association with *Phragmaticola aëdon.* It hops about the undergrowth singly, incessantly uttering its single harsh note '*Tschuk*' at intervals of a few seconds, varied occasionally by '*chur-r-r*' or '*chr-chr*'. It is a great skulker and seldom shows itself.

It is also a winter visitor to Ceylon.

The gonads of all the specimens were in a quiescent state.

Acrocephalus agricola Jerdon. The Paddy-field Warbler.

Specimens not procured.

A single example was flushed in a field of standing paddy in a forest clearing at Thattākād (200 ft.), but its identity remains unconfirmed. It has not been obtained in Travancore or Cochin before, the nearest records being from the Wynaad (Hume, *S.F.*, x, 390) and the pair collected by William Davison in the Brahmagiri Hills, Coorg, in February 1883 now in the British Museum.

Locustella naevia straminea Seebohm. The Eastern Grasshopper Warbler.

Specimens not procured.

Noted at Marāiyūr (Annemalāi Hills) and Pādagiri (Nelliampathies). Ferguson (*J.B.N.H.S.*, xv, 456) records a specimen obtained in a swamp in Travancore at 4,000 ft. elevation during April 1901. I procured one in the Biligirirangan Hills (4,500 ft.—Coimbatore District) on 29-12-32.

This species, apparently a winter visitor, was not uncommon on hillsides covered with tall grass (*Andropogon* sp.) interspersed with dwarf date palms above Kodekkādū (near Marāiyūr) at between 5 and 6 thousand feet elevation, especially on the edge of sholas. It was also present in similar facies around Pādagiri.

The bird was invariably met with singly, uttering '*chek-chek*' or '*chur-r, chur-r*' from its concealment, something like the notes of Blyth's Reed-Warbler. It is a great skulker and flushed only with difficulty when almost trod upon. After flying a few yards it dives headlong into the grass stems and is wellnigh impossible to flush a second time. So swiftly does it thread its way through the stalks low down near the ground that by the time one reaches the spot where it dived it has vanished mysteriously, and no amount of trampling around will avail!

Orthotomus sutorius sutorius (Pennant). The Tailor Bird.

Specimens collected: 245 [♂] 8-2-33 Thattākād 200 ft.; 616 ♀ juv., 617 ♀ 18-4-33, 634 ♂ 21-4-33 Aramboli 250 ft.; 722 ♀ (imm.) 25-7-33 (Thirūmalāi 100 ft.); 757 ♂ 31-7-33 (Akkūlam 150 ft.); 896 ♂ (imm.) 13-8-33 (Nettāyam 200 ft.) Trivandrum Talūk; 948 ♀ 6-12-33 Nemmāra 300 ft.

Elsewhere noted at: Marāiyūr (3,500 ft.); Kottāyam (ca. S.L.); Peermade (3,200 ft.); Kūmili (3,000 ft.); Rājampāra (1,350 ft.); Trivandrum Town (ca. S.L.); Cape Comorin (ca. S.L.); Chālakūdi; Wadakkāncheri (400 ft.); Trichūr; Ernakūlam (ca. S.L.).

Colours of bare parts: *Adult*: Iris and eyelids orange-brown to orange-red; bill, upper mandible excepting commissure horny-brown, commissure and lower mandible pinkish flesh colour; mouth pale flesh colour; legs and feet brownish flesh colour; claws dusky. *Juvenile* (No. 616): Iris pale olive-brown; upper mandible horny-brown, lower mandible pale flesh; gape yellow; mouth pinkish-yellow; legs, feet and claws pale pinkish-flesh.

[Measurements:

	Bill.	Wing.	Tail.	Tarsus.
4 ♂♂	15-16	48-51	37.5-55	19-19.5 mm.
2 ♀♀	15-16	43-46.5	34.5-36.5	19 mm.

It is with considerable hesitation that I attribute this series to the typical race for it is in truth intermediate. In colour the specimens agree with the Indian form *O. s. guzerata* but they are rather small and in that particular agree with the Ceylon bird. Also No. 757 ♂ dated 31 July has the tail in moult and the new feathers appear to be of the long summer type, which suggests that in Travancore as in the typical race of Ceylon the long pointed feathers may be found throughout the year.—H. W.]

The Tailor Bird is a common resident species in Travancore and Cochin, throughout the low country and up to at least 3,500 ft.—probably higher—in the hills. I do not seem to have come across it in the Nelliampathies, but Kinloch (*J.B.N.H.S.*, xxvii, 943) records it as common in those hills.

It frequents scrub and secondary jungle as well as hedges and shrubbery about cultivation and human habitations, being especially fond of the mango and jack-fruit gardens about homesteads along the backwaters.

In the Pālni Hills, Fairbank (*S.F.*, v, 406) records it from Shembaganur 5,500 ft. The typical race, *O. s. sutorius*, is also resident and common in Ceylon.

Breeding: On 15 April (Aramboli) a half-built nest was discovered in a small bush at 18 inches from the ground in fairly open scrub under a Babool grove. Several of the Jamūn-like leaves had been sewn together into a sort of funnel and one of the owners was observed lining it with vegetable down. Specimen No. 616 (18 April) was in juvenile plumage. No. 617 (same date) had enlarged ovarian follicles ca. 4 mm. in diameter and a prominent incubation patch, and was obviously breeding. No. 722 (25 July) had a soft skull and was undergoing post-juvenal moult, while 896 (13 August) also had an imperfectly ossified skull, but had already completed moult into fresh adult plumage.

The evidence shows that the breeding season in Travancore commences in April and probably lasts till the end of May or the middle of June. Ferguson (*J.B.N.H.S.*, xv, 456) says that it breeds in May.

Cisticola exilis erythrocephala Blyth. The Red-headed Fantail-Warbler.

Specimens not procured by the Surveys.

According to Ferguson (*J.B.N.H.S.*, xv, 456) this species is fairly common and resident on grasslands on the High Range in Travancore. Mr. Whistler has examined the following two specimens in the Trivandrum Museum collection: ♂ juv. 25-1-07, ♂ juv. 26-1-07 Devicolam. He measures them as follows:

	Bill.	Wing.	Tail.	Tarsus.
2 juv. ♂♂	12.5	45.5-48	51-53	18.5-19 mm.

In the Pālni Hills, Terry (*S.F.*, x, 476) found this warbler very common at Kukal and Kodaikanal. Fairbank (*S.F.*, v, 406) shot a ♂ on Mount Neboo (6,000 ft.) on 12 June and saw two others, while Mr. Howard Campbell also found it common in small colonies in those hills (*Fauna*, ii, 420).

No records of its breeding in Travancore or Cochin apparently exist.

Cisticola juncidis sálimalii subsp. nov. The Travancore Streaked Fantail-Warbler.

Specimens collected: 79 ♀, 80 ♀ (imm.), 81 ♀ (imm.), 82 ♂ 13-1-33 Marāiyūr 3,500 ft.; 357 o? 358 ♂ 25-2-33 Peermade 3,200 ft.; 382 ♀, 383 o? 384 ♀ 1-3-33 Kūmili 3,000 ft.; 508 ♂, 509 ♀, 510 ♂, 511 o? 5-4-33 (Velayāni Lake) Trivandrum Environs; 570 o?, 571 o?, 572 ♀ 12-4-33 Cape Comorin ca. S.L.; 623 ♂ 19-4-33 Arāmboli 250 ft.

Elsewhere noted at: Sānthanpāra (3,500 ft.); Kottāyam (ca. S.L.).

Colours of bare parts: Iris pale hazel-brown or pale olive-brown; bill, upper mandible and tip of lower pale horny-brown, commissure and rest of lower mandible pinkish flesh colour; mouth pink, brownish-pink or pale yellowish flesh-colour, in some individuals streaked or blotched with brown: legs and feet pale brownish flesh-colour; claws duskier.

[Additional specimens examined:

Trivandrum Mus. Coll.: ♂♀ 9-3-02 Trivandrum; ♂ 10-8-01, ♀ 8-8-01 Cape Comorin.

Measurements:

	Bill.	Wing.	Tail.	Tarsus.
5 ♂♂ (summer)	10.5-11	51-55.5	33-34	19 mm.
6 ♂♂ (winter)	10.5-11	47-52.5	37-40	18.5-19 mm.
3 ♀♀ (summer)	11-11.5	45.5-48.5	33-36.5	18-19 mm.
4 ♀♀ (winter)	11-11.5	46.5-48.5	35.5-40	17-18 mm.

At the time when I was writing the account of this species in the Eastern Ghats Survey (*J.B.N.H.S.,* xxxvi, 564) no specimens of the Streaked Fantail Warbler were available from Travancore for examination. Mr. Sálim Ali's fine series has now revealed the interesting point that this species has developed one of the peculiar dark Travancore races which we have found in so many other species. Compared with birds from North India, the Travancore series appears very 'saturated' and richly coloured, both on the upper surface and below. The rumps are bright reddish-brown and the flanks are washed with bright rufous. The small beak immediately separates the Travancore birds from the Ceylon race. I have submitted our birds to Rear-Admiral Hubert Lynes, the well-known monographer of this genus, and he agrees with the recognition of this well-marked race from the rain area. I have accordingly much pleasure in naming it after Mr. Sálim Ali in recognition of his valuable work in carrying out the Travancore Survey. The type No. 358, ♂ adult in winter plumage, 25 February 1933, Peermade 3,200 ft., has been deposited in the British Museum.—H. W.]

The Streaked Fantail Warbler is a common resident species in Travancore and found in suitable localities throughout the low country as well as up to at least 5,000 ft. in the hills. Standing paddy fields and areas under tall grass, especially on water-logged ground as on the margins of Periyār Lake and in the swampy depressions or 'valleys' among the hilltops at Wūndamet, seldom fail to attract it whilst it also frequents the grass-covered hillsides everywhere. Curiously enough I seem to have missed recording it in Cochin though there is no reason to doubt its occurrence there.

Though usually met with singly and never in flocks, it was not uncommon to find 10 or 15 birds gregariously in the same patch of grassland. They were also observed at times to alight on the ground, on bunds, etc. and hop about like Munias, presumably after insects. What were evidently courtship displays were in progress between January and March. A bird (♂?) launches from its perch near the tip of an upstanding grass-blade or reed, rises in the air for about 50 or 60 ft. in irregular wavering zigzags, and flies about in the same irregular undulations and wave crests in no particular direction. It closes its wings on each descending curve and flaps rapidly a few times on the upward curve. The actions are reminiscent of a Black-bellied Finch Lark. Just at the bottom, before commencing the upward curve, it utters a single '*chip*' like the snip of a barber's scissors heard in the distance. This is repeated about once every second and is also uttered from a perch at the same intervals. After flying about aimlessly in this manner for two or three minutes, the bird descends to a perch some distance away or in the same neighbourhood.

It has not been recorded from the Pālni Hills, but it is likely that some at least of Terry's notes thence (*S.F.*, x, 476) on *Cisticola e. erythrocephala* refer to this species.

In Ceylon it is represented by the race *C. j. omalura.*

Breeding: Apparently nothing is on record as regards the breeding season in this area. Of the specimens obtained by the Survey, Nos. 80 and 81 (13 January) were immature with imperfectly ossified skulls. No. 82 (same date and in the same paddy-field) had testes enlarged to 4×3 mm. and it was in worn breeding plumage. None of the others showed any gonadal development.

From his examination of the specimens, Admiral Lynes concludes that the breeding season in Travancore is probably from August until March.

Franklinia gracilis albogularis (Walden) ? The Coorg Wren-Warbler.

Specimens collected: 195 ♂ (imm.) 30-1-23 Sānthanpāra 3,500 ft.; 241 o? 8-2-33 Thattākād 200 ft.; 367 ♂, 368 ♂ 27-2-33, 389 ♀ 3-3-33 Kūmili 3,000 ft.; 466 ♂ 18-3-33 Rājampāra 1,350 ft.; 649 ♂ 23-4-33, 655 ♀ 25-4-33 Balamore Estate 2,000 ft.

Elsewhere noted at: Ūrūmbikera Reserve Forest (near Mūndakāyam); Wadakkāncheri (400 ft.); Pādagiri (3,000 ft.—Nelliampathies).

Colours of bare parts: *Adult*: Iris straw colour; bill black, horny at chin; mouth slaty-brown and pink or pinkish-brown; legs and feet brownish flesh colour; claws horny-brown. *Immature* (No. 195): Iris orange straw;

bill dark horny-brown, paler at commissure and gape. Mouth pale yellowish cream colour with slaty blotches; legs and feet yellowish flesh colour; claws horny-brown.

[Additional specimens examined:

Trivandrum Museum: ♂ 30-8-03, ♀ 3-8-08 Konni; o? 2-8-00, oo juvs. 27-7-00 Ponmudi.

Brit. Mus.: o? 15-3-75 Elgugand (Bourdillon).

Measurements:

	Bill.	Wing.	Summer tail.	Winter tail.
4 ♂♂	12-13	46-46.5	45-47	46 mm.
1 ♀	13	44	39	— mm.

N.B.—Nos. 195 and 367 both appear to me to be in moult from juvenile to first winter plumage so they are omitted from the measurements.

In the Eastern Ghats Report (*J.B.N.H.S.*, xxxvi, 564) I suggested that this species would probably prove to have races when better material was available. This has been confirmed though my additional material is not quite sufficient yet to allow me to work out the question fully for the whole of the range.

First of all I am definitely of the opinion that the Ceylon bird requires separation on the grounds that the summer and winter plumage are alike, both being of the type which in continental India is the breeding plumage, i.e. dark above with a grey pectoral band. The tail is the same length in both seasons and the juvenile plumage resembles that of the adults in the possession of the pectoral band. This similarity between summer and winter plumage in Ceylon is an interesting parallel with the cases of *Prinia sylvatica valida* and *P. inornata insularis* in Ceylon, already described in the Eastern Ghats Survey. The name for this race is evidently *Prinia pectoralis* Legge, *Ceylon Blue Book,* 1874, p. 9—Hambantota District, Ceylon.

The Travancore bird also requires separation. It has a definite summer and winter plumage, and the particular interest of this form lies in the fact that the pectoral band, distinct as in other continental forms in summer plumage, is also adumbrated in the winter plumage, thereby connecting the extreme difference of the continental Indian and insular Ceylon forms. The upper parts and wings are considerably darker and more saturated in winter plumage than in the winter plumage of the typical form. The upper parts may also be darker in summer plumage, but summer plumage wears and bleaches so rapidly in this species that I cannot speak positively on the point without a larger series. There is no existing name available for the Travancore race but it is possible that Coorg birds are sufficiently close to it to allow the name *Prinia albogularis* Walden, *Ann. Mag. N.H.,* 1870, vol. v, p. 219—Coorg to apply to both. The only two specimens in existence from Coorg however are two summer birds and these do not allow the point to be settled.—H. W.]

Franklin's Wren-Warbler is a common resident species in the Travancore-Cochin area, being met with by the Surveys both in the low country and in the hills up to about 5,000 ft. Ferguson (*J.B.N.H.S.,* xv, 457) states that it occurs at all elevations. It does not enter evergreen sholas but frequents the patches of tall grass, scrub and deciduous jungle on the hillsides which often alternate with them, and also similar facies in the low country. It usually keeps in small parties of 3 to 5 birds, but flocks of 10 or 12 may sometimes be seen. They are active, restless little birds for ever on the move, and in tall grass country their presence is usually proclaimed by their tinkling calls as they hop about among the stems. One seldom gets a glimpse of them unless an individual momentarily clambers up to the top or as they fly from one thicket to another. They were much more in evidence with the approach of the breeding season when males constantly clambered up on to exposed perches on bushtops or grass and uttered their 'chipping' song.

The birds were observed feeding regularly on nectar from the blossoms of *Erythrina lithosperma* shade trees in abandoned tea clearings overgrown with tall grass and bushes.

This Wren-Warbler does not appear to have been recorded in the Pālni Hills. In Ceylon it is represented by another race, *F. g. pectoralis,* with a local distribution.

Breeding: The Surveys found that at the end of April (Ashāmbū Hills 2,000 ft.), the birds were either breeding or ready to do so. In No. 649 (23 April—fresh summer plumage) the testes had enlarged to 4×3 mm., while No. 655 (25 April also in fresh summer plumage) had a soft ovarian egg.

According to T. F. Bourdillon (*J.B.N.H.S.*, xv, 457) the breeding season in Travancore is May, June and July, the birds preferring elevations between 300 and 1,000 ft. above sea level for the purpose.

Schoenicola platyura (Jerdon). The Broad-tailed Grass-Warbler.

Specimens collected: 334 [♂] 22-2-33, 355 ♂, 356 o? 25-2-33 Peermade 3,200 ft.; 399 [♀] 5-3-33, 413 ♀ 7-3-3 Kūmili 3,000 ft.; 438 ♂, 439 ♀ 11-3-33 Camp Derāmalāi 4,000 ft.; 660 ♀, 661 ♂, 662 ♂ 25-4-33 Mūthūkūzhi, Ashāmbū Hills—3,500 ft.; 1053 ♂, 1054 ♂, 1055 ♂ 23-10-33 Peermade 3,200 ft

Elsewhere noted at: Sānthanpāra (3,500 ft.—Cardamom Hills).

Absent on *Andropogon* grass-covered hillsides between 3,000 and 4,500 ft. on the Nelliampathy Hills (16-20 December 1933) although facies apparently suitable!

Colours of bare parts: Iris brownish-grey, greyish-olive or olive brown; bill, upper mandible horny-brown, lower horny-grey or flesh colour; mouth yellowish-pink, paler in some individuals and stippled with brown in others; gape yellowish cream colour or yellow; legs, feet and claws greyish-brown.

[Additional specimens examined:

B.N.H.S. Coll.: ♂ 30-5-96 Kodaikanal (Cook).

Brit. Mus. Coll.: ♂♀ 6-4-01, ♂ 5-4-01 Muthukaly [Mūthūkūzhi ?] (Ferguson); ♂♂♀ 17-4-80 Colathoorpolay [Kulattūpūzha] Patnas 4,000 ft. (Bourdillon—Hume Coll.); ♀ 18-4-77 same locality 3,800 ft. (Bourdillon); ♂ 25-6-81 Pālnis 5,000 ft. (Fairbank); ♂ 26-4-83 Pittur, Pālnis (Terry).

Measurements:

	Bill.	Wing.	Tail.	Tarsus.
8 ♂♂	13.5-16	64.5-69	71-73	21-23 mm.
4 ♀♀	13-14	63-64.5	63-66	21-21.5 mm.

In the *New Fauna*, ii, p. 436, Mr. Stuart Baker has given a note on the possibility of there being two races of this bird in its limited distribution on the Western Ghats from South Travancore to Belgaum. He bases the possibility on the two items of size and colour. With regard to size, he states that birds from Travancore and Ceylon measure 63 to 67 in length of wing and birds from Belgaum 66 to 71 mm. I measure the Belgaum series as follows:

	Bill.	Wing.	Tail.
5 ♂♂	14-15	70-72	65.5-72.5 mm.
2 ♀♀	14-14.5	66.5-67	61.5-64.5 mm.

Compared with our Travancore series there is evidently no ground for separating birds from the two areas on size.

As regards colour, this point could not be settled on the British Museum series even when augmented by Mr. Sálim Ali's fine collection. The Belgaum birds were all collected in September and they are in very worn and faded dress, whereas all the Travancore birds were collected from February to April and are evidently in much fresher plumage after the complete moult which must take place in the winter. Mr. Pillai, however, very kindly made a special point of collecting three males for us in October on Peermade, so that they should be in a state of plumage comparable with the Belgaum series. These prove to be dull and faded before the approaching moult and cannot be separated from the Belgaum birds. The possibility of two races has therefore been thoroughly disposed of.—H. W.]

The Broad-tailed Grass-Warbler is common in the Travancore Hills between about 3 and 4,000 ft. Ferguson (*J.B.N.H.S.*, xv, 457) did not meet with it at Peermade or on the High Range, though the Survey found it not uncommon in the former locality. It frequents tall grass-covered hillsides, often steep and precipitous, and is particularly fond of the marshy or moist flat depressions among the hilltops overgrown with thin matted grass or reeds as about Wūndāmet in the Cardamom Hills and at Camp Derāmalāi. It is an inveterate skulker and all that has been written about the habits of the Streaked Grass-hopper Warbler applies to it in every detail. In patches where it occurs I found its population to be not denser than about one bird—or more rarely a pair—to an acre, and the individuals always keep widely scattered. In the mornings usually while the grass is still heavily sodden with dew, and also in the late afternoons about sunset, single birds were occasionally observed clambering up the grass stems to exposed situations near the tips and uttering a feeble '*pink, pink*', etc. somewhat similar to but louder than that of the Red Munia (*Amandava*). The flight is indirect and top-heavy like that of *Prinia* or *Cisticola,* and the broad graduated tail conspicuous on the wing.

Neither Fairbank nor Terry record this species in their Pālni lists though specimens collected by them in those hills are now in the British Museum.

In Ceylon it is believed to occur, but rarely.

Breeding: No nests appear to have been taken in Travancore. Bourdillon considered that they were breeding there in April and this presumption is partly supported by the evidence obtained by the Survey. Specimen No. 661 (25 April—fresh plumage) had testes enlarged to 6×4 mm. and in No. 662 (same date—undergoing complete moult) they measured 6×3 mm. and suggested that the birds were breeding or about to. The organs in all the 3 October specimens were enlarged to breeding condition. In Belgaum, Col. A. E. Butler and Mr. T. R. Bell took many nests in September. Is it double-brooded or is there no definite season?

Phragmaticola aëdon (Pallas). The Thick-billed Warbler.

Specimens collected: 68 ♀ 12-1-33 Marāiyūr 3,500 ft.; 154 ♀ 25-1-33 Sānthanpāra 3,500 ft.; 225 ♀ 6-2-33, 252 ♀ 9-2-33 Thattākād 200 ft.; 450 ♀ 17-3-33, 460 ♂ 18-3-33 Rājampāra 1,350 ft.; 967 ♂ 12-12-33 Pādagiri 3,000 ft.

Elsewhere not noted.

Colours of bare parts: Iris hazel-brown to olive-brown; upper mandible horny-brown, lower yellowish flesh colour; gape and mouth bright orange yellow; legs and feet plumbeous; claws horny-brown.

[Measurements:

	Bill.	Wing.	Tail.	Tarsus.
3 ♂♂	19.5-21	84.5-86	88-90.5	27-29 mm.
5 ♀♀	18-20.5	78.5-84	83-87	26-29 mm.

All the Survey specimens are of the fulvous-brown type of colouration.—H. W.]

Ferguson says (*J.B.N.H.S.*, xv, 457) that in Travancore 'it is a very occasional winter visitor. I have only one specimen shot at the foot of the hills'. In view of this statement it is interesting to record that the Surveys found this species fairly common between 12 December and 18 March in suitable localities, at elevations from 200 up to 3,500 ft. in both Travancore and Cochin. Its favourite haunts are the patches of tall grass and weeds that so luxuriantly overrun abandoned forest clearings, and the growth of grass tussocks and bracken bushes on water-logged ground in ravines etc. through tea and coffee plantations.

As it hops about the undergrowth it utters a loud, harsh quick-repeated '*tschuck, tschuck*' and '*chr-r*' etc., the latter like the agitated notes of the Black-headed Babbler (*Rhopocichla*), but louder. These calls are sufficiently distinctive, with a little practice, to proclaim its identity long before a glimpse of their skulking producer can be obtained.

It has not been recorded from the Pālni Hills or from Ceylon.

Hippolais rama rama (Sykes). Sykes' Tree-Warbler.

Specimen collected: 543 ♀ 8-4-33 Cape Comorin ca. S.L.

Elsewhere not noted: Possibly confused with *Acrocephalus dumetorum.*

Colours of bare parts: Iris olive-brown; fine rim round eye (eyelids) magenta; upper mandible horny-brown, lower pinkish flesh colour; mouth orange-yellow; legs, feet and claws brownish flesh colour.

This species is apparently a fairly common winter visitor to Southern India but I do not record sight observations as it is not easy to differentiate it with certainty in the field from the commoner *Acrocephalus dumetorum*, while the habits and call notes of the two are also practically indistinguishable. The specimen was in fresh plumage and very fat, suggesting that it was ready to emigrate.

Curiously enough the only other example recorded from Travancore (*J.B.N.H.S.*, xv, 457) was also obtained at Cape Comorin (December 1901).

Phylloscopus affinis (Tickell). Tickell's Willow-Warbler.

Not procured or noted by the Surveys, but Ferguson (*J.B.N.H.S.*, xv, 457) records specimens obtained during the winter months from the High Range of Travancore at 6,000 ft. elevation—never in the plains.

In the Pālni Hills it is apparently common at Pulungi and one collected by Fairbank on 3 April is now in the British Museum. It does not seem to migrate as far south as Ceylon.

[**Phylloscopus inornatus humei** (Brooks). Hume's Willow-Warbler.

Not procured by the Surveys, neither is it mentioned in Ferguson's Travancore list nor in those of Fairbank and Terry for the Pālni Hills. On what authority it is stated in the *Fauna* (ii, 469) to extend in winter as far south as Travancore is not known.]

Phylloscopus nitidus nitidus Blyth. The Green Willow-Warbler.

Specimens collected: 25 ♂ 7-1-33, 94 ♂ 14-1-33 Marāiyūr 3,500 ft.; 235 ♀ 7-2-33, 244 o? 8-2-33 Thattākād 200 ft.; 447 ♂ 16-3-33 Rājampāra 1,350 ft.; 920 ♂ 29-11-33 Wadakkāncheri 400 ft.; 1019 o? 26-12-33 Karūpadanna ca. S.L.

[There is a specimen with no data from Mynall in the British Museum by Bourdillon.

Measurements:

	Bill.	Wing.	Tail.	Tarsus.
4 ♂♂	12-13.5	63-67	48-49.5	19-19.5 mm.
1 ♀	13	62.5	48	18 mm.—H. W.]

Phylloscopus nitidus viridanus Blyth. The Greenish Willow-Warbler.

Specimens collected: 119 ♂ 20-1-33 Mūnnār 5,000 ft.; 365 ♀ 27-2-33 Kūmili 3,000 ft.

[Measurements:

	Bill.	Wing.	Tail.
1 ♂	14	64	48 mm.
1 ♀	13	58	— mm.—H. W.]

Elsewhere noted at: Kottāyam (ca. S.L.); Peermade (3,200 ft.); Tenmalāi (500 ft.); Chālakūdi; Kūriārkūtti (1,600 ft.); Nemmāra (300 ft.); Pādagiri (3,000 ft.).

Colours of bare parts: Iris brown; bill, upper mandible and tip of lower horny-brown, commissure and rest of lower mandible pale flesh colour; mouth pale yellow and greyish-pink, or yellow; in some individuals gape also yellow; legs and feet greenish-grey or pale horny-brown; soles yellowish.

I treat these two forms together as I am totally unable to distinguish them in the field. The call-notes of the Willow-Warblers once ascertained by properly authenticated specimens, appear to me to be the most satisfactory guide to distinguishing many of the confusing species in life, but in the case of these two they are so similar that this method fails.

Both the Green and the Greenish Willow-Warblers are common winter visitors to Travancore and Cochin, the low country as well as to at least 5,000 ft. up in the hills. The latest record I have is 27 March by which date the majority of birds had certainly departed. Ferguson (*J.B.N.H.S.*, xv, 458) shot two specimens as late as July and suggests that some may remain through the summer.

They are usually met singly hopping about amongst undergrowth and the foliage of trees both in deciduous and, to a lesser extent, in evergreen jungle, uttering a merry, penetrating '*chi-wee*' at intervals of a few seconds. The Surveys also found them invariably present among the fruit gardens about backwater homesteads and in wooded compounds of the larger towns.

They have apparently not been recorded from the Pālni Hills where they must doubtless occur. Both forms are also winter visitors to Ceylon, the latter having occurred in the island in March.

Phylloscopus magnirostris Blyth. The Large-billed Willow-Warbler.

Specimens collected: 165 ♂ 26-1-33 Sānthanpāra 3,500 ft.; 328 ♀ 22-2-33 Peermade 3,200 ft.; 862 o? 14-11-33 Kūriārkūtti 1,600 ft.

Elsewhere noted at: Kūmili (3,000 ft.—Periyār Lake Environs); Kūvalle Incline (Cochin Forest Tramway); Chālakūdi; Wadakkāncheri (400 ft.); Pādagiri (3,000 ft.—Nelliampathy Hills).

Colours of bare parts: Iris hazel brown; bill horny-brown, pale flesh colour at gape, chin, commissure and tip of lower mandible; mouth pale pinkish-yellow; legs, feet and claws greyish-brown or brownish-slate.

[Additional specimen seen:
Brit. Mus. Coll.: ♀ 15-11-74 Mynall (Bourdillon).

Measurements:

	Bill.	Wing.	Tail.	Tarsus.
1 ♂	15	73	54	19 mm.
1 ♀	14.5	62.5	47.5	18.5 mm.—H. W.]

The Large-billed Willow-Warbler is also a common winter visitor to this area, the latest date I have being 7 March. In my experience it is far more partial to evergreen forest than the two foregoing, and commoner than either the Green or the Greenish Willow-Warbler in the sholas (up to 4,000 ft. !). William Davison (*Ibis* 1883, pp. 146-7) also found it very common 'in the Travancore Hills'. In the short time he was there he collected 19 specimens and says he could easily have got 50 more.

The call-note is a mousy, interrogative '*whee-chi?*', besides which a short feeble song was occasionally heard.

It has not been recorded from the Pālni Hills. In Ceylon it is a winter visitor.

Phylloscopus occipitalis occipitalis (Blyth). The Large Crowned Willow-Warbler.

Specimens collected: 124 ♂ 22-1-33 Sānthanpāra 3,500 ft.; 372 o? 28-2-33 Kūmili 3,000 ft.; 430 ♀ 9-3-33 Camp Derāmalāi 3,000 ft.; 981 ♂ 15-12-33 Pādagiri 3,000 ft.

Elsewhere noted at: Thattākād (200 ft.).

Colours of bare parts: Iris brown; bill, culmen brown, commissure, tip and lower mandible pale orange-yellow; mouth pale yellow; legs, feet and claws greyish-brown or brownish-slate; soles pale yellow.

[Measurements:

	Bill.	Wing.	Tail.	Tarsus.
2 ♂♂	13-13.5	66-68	54	17 mm.
1 ♀	13.5	61	45	19 mm.—H. W.]

A common winter visitor to Travancore and Cochin. Last noted 9 March. This Warbler is confined to evergreen forest mostly on the hills between 3 and 4,000 ft. elevation, but it also occurs in this biotope in the low country. Unlike the preceding 3 species, it is gregarious in its habits and moves about in active flocks of from 10 to 30 birds amongst the foliage of lofty trees in sholas, searching the sprigs for insects. They were invariably found in association with other small birds such as *Culicicapa*, *Zosterops*, *Machlolophus*, *Muscicapula pallipes* and *Alcippe poioicephala*.

It has not been recorded from the Pālni Hills or from Ceylon.

Prinia socialis socialis Sykes. The Ashy Wren-Warbler.

Specimens collected: 147 ♂ 24-1-33 Sānthanpāra 3,500 ft.; 351 ♂ 24-2-33 Peermade 3,200 ft.; 407 ♂ 5-3-33, 416 ♂ 7-3-33 Kūmili 3,000 ft.; 431 ♀ 10-3-33 Camp Derāmalāi 3,000 ft.

Elsewhere noted at: Rājampāra (1,350 ft.); Balamore Estate (2,000 ft.—Ashāmbū Hills).

Noted as absent in Cochin at the following places: Kūriārkūtti (1,600 ft.); Wadakkāncheri (400 ft.); Nemmāra (300 ft.); Pādagiri (3,000 ft.); Trichūr.

[Additional specimen examined:
Trivandrum Museum Coll.: o? 2-1-04 Arnakal.

Measurements:

	Bill.	Wing.	Tail.	Tarsus.
4 ♂♂	14	48-50.5	60-65	20-20.5 mm.
1 ♀	14.5	46	55	— mm.

All specimens in winter plumage.—H. W.]

The Ashy Wren-Warbler is a resident species in Travancore, not uncommon where it occurs, but curiously patchy in its distribution. During the whole of the Cochin Survey it was noted as 'absent'. It frequents tall grassland on the hillsides (between 1,500 and 3,500 ft. !) and was not observed in the low country at all though Ferguson states (*J.B.N.H.S.*, xv, 458) that it is found in suitable localities there. At Wūndāmet in the Cardamom Hills (ca. 3,000 ft.) it was common among the matted grass and reed-beds in the water-logged hollows or 'valleys' where the birds appeared to have concentrated owing to the burning of the grass on the surrounding hilltops.

Fairbank (*S.F.*, v, 406) obtained a specimen on a grassy hillside at 6,000 ft. in the Pālni Hills, but he does not say anything about its numbers there. Terry says (*S.F.*, x, 476) that it is not uncommon on the slopes in the long grass near Pulungi and Pittur. It is represented in Ceylon by the slightly smaller and shorter tailed race *P. s. brevicauda* Legge.

Breeding: The gonads of all the Survey specimens were in normal non-breeding condition. According to T. F. Bourdillon (*J.B.N.H.S.*, xv, 458) this Wren-Warbler 'breeds [in Travancore] most abundantly on the lower slopes of the hills in May and June and also in July'.

Prinia sylvatica sylvatica Jerdon. The Jungle Wren-Warbler.

Specimens collected: 627 ♂ 19-4-33, 630 ♂ 20-4-33, 639 ♂, 640 ♀ 21-4-33 Arāmboli 250 ft.

Elsewhere not noted.

Colours of bare parts: Iris bright brownish-yellow or orange-brown; rim round eye (eyelids) paler; bill blackish-brown, paler at chin and on gonys; mouth brownish-slate or pink with brownish streaks; legs and feet brownish flesh colour; claws horny-brown.

[No other specimens seen.
Measurements:

	Bill.	Wing.	Tail.	Tarsus.
3 ♂♂	14.5-16.5	61-62	67-67.5	22-23.5 mm.
1 ♀	14	53.5	57.5	— mm.

All in winter plumage. These are the first specimens I have seen from Travancore and they agree definitely with the typical form and not the Ceylon race.—H. W.]

The Jungle Wren-Warbler has apparently not been recorded from Travancore before. The Survey met with it only at Arāmboli at the southern end of the Ashāmbū Hills and on the western extremity of the gap or pass through the Ghats leading into the drier district of Tinnevelly (Madras Presidency). It frequented steep boulder-strewn hillsides with sparse cactus and thorn bushes where males were constantly observed perching on the boulders or in exposed positions on bushes and warbling '*Pretty-pretty*', etc. reminiscent of a Tailor-bird's call, but louder and easily distinguishable from it. It was repeated for three minutes or more at a stretch and resumed after a pause of two or three seconds. Each '*pretty*' of the song is preceded by a curious subdued ventriloquistic '*pit*' uttered in a different key. The birds were extremely wary and difficult to approach. Their absence from the rest of Travancore and from Cochin suggests that their habitat is confined to broken, boulder-covered hills with sparse and stunted vegetation, a facies which does not occur elsewhere within the area.

It has not been recorded in the Pālni Hills. The race *P. s. valida* represents it in Ceylon.

Breeding: From the excited behaviour of the birds at the time (middle to end April) it was evident that they were nesting. No. 627 (19 April) had testes enlarged to 6×4 mm. and on the same date another bird was observed carrying building material. In No. 639 (21 April) the testes measured 5×4 mm. Its pair, 640, had probably finished laying but there was a conspicuous incubation patch present. From the agitated behaviour of this pair—hopping about the bushes and uttering '*pit-pit-pit-pit*', etc.—it was clear that they had a nest (or young ?) in the neighbourhood.

Prinia inornata franklinii Blyth. The South Indian or Nilgiri Wren-Warbler.

Specimens collected: 194 ♀ (imm.) 30-1-33 Sānthanpāra 3,500 ft.; 241 o?, 242 ♂ 8-2-33, 276 ♀ (imm.) 12-2-33 Thattākād 200 ft.; 284 o?, 285 ♀ 15-2-33 Kottāyam ca. S.L.; 389 ♀ 3-3-33 Kūmili 3.000 ft., 434 ♀ 10-3-33 Camp Derāmalāi 3,000 ft.; 1005 ♂ 25-12-33, 1016 ♂ 26-12-33, 1050 ♀, 1051 ♂ 31-12-33 Karūpadanna ca. S.L.

Elsewhere noted at: Peermade (3-4,000 ft.); Wadakkāncheri (400 ft.—only 1 in a paddy-field; unconfirmed !); Nemmāra (300 ft.—very scarce).

Colours of bare parts: *Adult*: Iris and eyelids brownish-yellow or orange-straw colour; bill, upper mandible and tip of lower horny-brown, rest of lower mandible pale flesh colour; mouth blackish-brown, brownish flesh colour or pale pink with brownish streaks and blotches (probably seasonal); legs and feet brownish flesh colour; claws dusky. *Immature*: Iris pale khaki; gape and eyelids yellow; mouth pinkish-yellow; legs and feet as in adult but with a pinkish flush.

[Measurements :

	Bill.	Wing.	Summer tail.	Winter tail.
4 ♂♂	13.5	47-50.5	53-55.5	— mm.
2 ♀♀	12.5-13	48.5-49	50.5-51	— mm.
3 ♀♀	12.5-13.5	46-49	—	57.5-63 mm.

Nos. 241, 242, 284, 285, 1005, 1016, 1050 and 1051 are all in breeding plumage which is evidently assumed by a complete pre-nuptial moult about December. Nos. 194, 276, 389 and 434 are either birds in juvenile plumage or in their first winter plumage, evidently agreeing with the adult winter plumage in colour and greater length of tail. The series has therefore satisfactorily cleared up the point—shown in the Eastern Ghats Survey, *J.B.N.H.S.*, xxxvi, 577, as obscure—that in this race the relationship between the summer and winter plumages[1] is in line with that of the other continental forms and not as in the Ceylon race. These plumages are much darker and browner than in the typical race with the tail markings more distinct. The difference between them of course accounts for Ferguson's belief that two forms of this Wren-Warbler were to be found in Travancore.—H. W.]

This Wren-Warbler is common among the grassy bunds and paddy-fields about the backwaters both in Travancore and Cochin, and is also found to a lesser extent in undulating grassland in deciduous country and on the hills in similar facies up to at least 4,000 ft. elevation. Ferguson (*J.B.N.H.S.* xv, 459) found it up to 6,000 ft. ("*P. jerdoni*"). I did not come across it in the Nelliampathy Hills at all. Its distribution is patchy and capricious, the birds being absent from many areas to all appearances eminently suited to them.

In the Pālni Hills, Fairbank (*S.F.*, v, 406) observed it chiefly above 5,000 ft. elevation in long grass and fern thickets. In Ceylon it is represented by the race *P. i. insularis* (Legge).

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[1] Or more intelligibly in Travancore 'breeding and non-breeding plumages.'

Breeding: The earliest date on which nesting activity was noted was 8 December (Nemmāra) when a bird was observed carrying building material —a strip of paddy leaf. No. 1016 (26 December) had its testes enlarged to 6×4 mm. and it was undergoing complete pre-nuptial moult. Nos. 194 (30 January) and 276 (12 February) were immature with imperfectly ossified skulls and evidently lately out of nest. In 285 (15 February) the ovarian follicles measured 1-1.5 mm. At this time males were warbling excitedly from exposed perches on grass or paddy stems and chasing each other about. An individual was observed carrying a green caterpillar in its bill and from all these signs it was obvious that breeding was in progress.

From the evidence obtained, the breeding season in Travancore-Cochin appears to be earlier than that given for the Nilgiris (March to July), but how long it continues here is not known. The two specimens obtained on the hills in March had undeveloped gonads.

FAMILY: IRENIDÆ.

Irena puella puella (Latham). The Fairy Blue-bird.

Specimens collected: 28 ♂, 29 ♀ 7-1-33 Marāiyūr 3,500 ft.; 462 ♂ 18-3-33 Rājampāra 1,350 ft.; 971 ♂ 12-12-33, 975 (not sexed—alcohol sp.) 13-12-33, 979 (not sexed—alcohol sp.) 14-12-33 Pādagiri 3,000 ft.

Elsewhere noted at: Sānthanpāra (3,500 ft.); Thattākād (200 ft.); Ūrūmbikera Reserve Forest (ca. 1,000 ft.—near Mūndakāyam); Peermade (3,200 ft.); Kūmili (3,000 ft.—Periyār Lake Environs); Tenmalāi (500 ft.); Balamore Estate (2,000 ft.—Ashāmbū Hills); Kūvalle Incline (Cochin Forest Tramway); Kūriārkūtti (1,600 ft.).

Colours of bare parts: Iris claret or scarlet; bill in ♂ black, in ♀ brownish-black; mouth greyish-pink; legs, feet and claws black.

[Additional specimens examined:

Brit. Mus. Coll.: Ad. ♂♂ 12-12-78, 24-7-78, 20-11-74, 11-11-78 and -10-78; ♀♀ 5-12-78, 29-11-78 Mynall (Bourdillon).

Measurements:

	Bill.	Wing.	Tail.	Tarsus.
9 ad. ♂♂	27.5-30	124.5-134	100-106	18-18.5 mm.
3 ♀♀	27-30	127-127.5	101.5-104	17.5 mm.

The juvenile plumage is a dull edition of that of the adult female except that the wings and their coverts have very little of the blue-green wash and the lower parts are dull sooty-black with only a few feathers blue-green. The first primary is softer and rather more rounded than in the adult while the tail feathers are narrower. The first winter male resembles the adult female still more closely, but I have not seen enough material to work out the moults.—H. W.]

The Fairy Blue-bird is a resident of evergreen forest and is found in Travancore and Cochin wherever this biotope occurs both in the low or foot-hills country (cf. Thattākād) and up in the highest sholas. Parties of 7 or 8 birds are commonly met with flying about among the lofty tree-tops uttering a pleasant musical '*weet-weet*' as they do so. They also occasionally descend into low bushes to feed on various berries. They are very fond of the various species of *Ficus* figs, and flowers of *Erythrina lithosperma* shade trees in coffee estates are regularly visited for the nectar. Two of the specimens shot off these had pollen adhering to their chin feathers. The call-note most usually heard is a rich, mellow, percussive '*Whats it*' repeated every few seconds.

Fairbank (*S.F.*, v, 406) records this species as common in the Pālni Hills from their base up to 4,500 ft. In Ceylon it is probably only a straggler.

Breeding: The birds were evidently breeding in March. Specimen No. 462 (18 March) had its testes enlarged to 11×7 mm.; it was in fresh plumage and was observed tugging at dry twigs for a nest.

According to T. F. Bourdillon (*J.B.N.H.S.*, xv, 262) it builds in Travancore at elevations between 500 and 3,000 ft. above sea level from January to May. Kinloch took eggs in the Nelliampathy Hills on 26 February, and

Stewart in Travancore in every month from January to June. Most eggs are said to be found in March and April. The normal clutch is almost invariably 2 eggs, but c/3 has once been taken and one incubated egg is occasionally found (*Nidification*, ii, 497).

FAMILY: ORIOLIDÆ.

Oriolus oriolus kundoo Sykes. The Indian Oriole.

Specimens collected: 269 ♂ 11-2-33 Thattākād 200 ft.; 486 ♀ 24-3-33 Tenmalāi 500 ft.

Elsewhere noted at: Sānthanpāra (3,500 ft.); Kottāyam (ca. S.L.); Kūmili (3,000 ft.); Kūriārkūtti (1,600 ft.); Wadakkāncheri (400 ft.); Nemmāra (300 ft.); Pādagiri (3,000 ft.—Nelliampathies); Trichūr Town; Karūpadanna (ca. S.L.).

Colours of bare parts: Iris brownish-scarlet; bill reddish-brown; mouth pinkish flesh; legs and feet slate; claws horny-brown.

[Other specimens examined:

Brit. Mus. Coll.: ♀ 13-11-78 Trivandrum; ♀ 11-3-77, ♀ 20-12-78 Mynall (Bourdillon).

In the *Ibis* 1916, pp. 56-7, Dr. C. B. Ticehurst made some notes on the plumages of a series of orioles collected by me in Jhelum District, Punjab. That account is now expanded after the examination of a considerable amount of fresh material.

In juvenile plumage (presumably of both sexes), the crown, ear coverts and hind-neck are yellowish-green with an indistinct dusky loral band; upper parts olive-green with pale tips to the feathers; upper tail coverts bright yellow; wings dark brown, all the lesser and median coverts and the tertiaries washed with olive-green and with pale tips; primary coverts dark brown, the ends of the feathers with well-defined yellow edges; primaries and secondaries dark brown, edged with greyish-white; tail olive-green all but the central pair of feathers with bright yellow tips to their inner webs, broadest towards the outer feathers. The underparts are white, washed with pale yellow on the flanks, all the feathers with dark brown shaft streaks except on the chin and throat; undertail coverts bright yellow.

The post-juvenal moult takes place about August. The male in first winter plumage has the whole of the upper plumage and sides of the head except for an indistinct dusky loral band, greenish-yellow, brightest on the supercilium and rump and dullest on the wing coverts; the primaries and secondaries, the primary, median, and greater wing coverts and the tail are retained from the juvenile plumage. Lower plumage greyish-white, the sides of the breast, the flanks and the undertail coverts golden yellow, the breast and flanks having broad blackish-brown shaft streaks.

The male in second winter plumage is very similar but the loral streak is darker and better defined and there is more yellow on the lower plumage. This stage may however be easily recognised by the primary coverts which have their yellow tips much wider and yellower, forming a distinct yellow patch, while the lesser wing coverts are irregularly blotched with brownish-black.

Third winter males are still brighter and yellower on the upper parts; the lower plumage is bright orange-yellow throughout, almost but not quite as clear as in the adult, and the shaft streaks are narrow, indistinct and sometimes absent. The wings now resemble those of the adult being black with a yellow patch on the primary coverts and distinct yellow tips to most of the primaries and secondaries. The lesser and median coverts, the tertiaries and to a lesser extent the secondaries are still, however, much washed with olive-green while the yellow patch on the primary coverts is neither so large nor so pure as in the adult. The tail in this stage is also distinctive; the central pair of feathers is olive-green with black tips and a terminal yellow triangular spot, the amount of yellow in the other feathers being greater than in the last stage.

Finally the adult male plumage—as described in all text-books—is assumed at the fourth autumn. The brown iris of the juvenile has become red by the first summer, the males breeding in their first year in spite of the much longer period necessary for the assumption of full plumage.

The first winter female only differs from the first winter male in having the under plumage whiter, lacking most of the yellow wash on the breast and flanks.

In second winter plumage she appears to be quite indistinguishable from the male of a similar age, while the adult plumage—of the text-books—is assumed in the third winter, that is at the post-nuptial moult at the end of the second breeding season.

The autumn moult is always complete except in the case of the first, viz. the post-juvenal moult when the wings and tail are retained from the juvenile plumage as mentioned above. There appears to be no spring moult.

It is not quite clear to me whether some females attain a plumage similar to that of the adult male. I have seen birds, which on plumage could certainly not be distinguished from adult males, marked as females but there was nothing to show whether the sexing was reliable.[1] There is, however, one adult female in the Scully Nepal Collection in the British Museum which differs from the adult male only in having the central pair of tail feathers green with black tips. This is reliably sexed as there is a drawing of the enlarged ovary on the label.—H. W.]

The Indian Oriole is, as Ferguson observes (*J.B.N.H.S.*, xv, 461) sparingly met with in the low country of Travancore and also in the hills, in my experience up to about 3,500 ft. elevation. According to him it is a resident species. The Survey noted it as most abundant at camps between 25 January and the end of March. By about the middle of April it was not in evidence at all and it seems more than probable that the majority of birds had left. Kinloch (*J.B.N.H.S.*, xxvii, 941) describes it as 'very common' in the Nelliampathy Hills at what season he does not say, and its status there is presumably the same as in Travancore. The Cochin Survey found it only moderately common at Pādagiri in December.

This Oriole frequents open secondary forest either deciduous or with a mixture of evergreen species, well-wooded compounds and groves of trees about cultivation, and is often met with in the localised bird associations. It was observed feeding largely on Peepal figs (*Ficus religiosa*), Lantana berries and on the nectar of *Erythrina lithosperma* blossoms.

It has apparently not been recorded in the Pālni Hills or in Ceylon.

Breeding: The gonads of the specimens were in a quiescent state and no record of its breeding in Travancore or Cochin exists.

Oriolus chinensis diffusus Sharpe. The Indian Black-naped Oriole.

Specimen collected: No. 451 ♀ (imm.) 17-3-33 Rājampāra 1,350 ft.

Elsewhere noted at: Thattākād (200 ft.).

Colours of bare parts: Iris brown, rest as in *kundoo*.

[Measurements:

Bill.	Wing.	Tail.
33	149	93.5 mm.—H. W.]

This oriole was observed singly in small numbers in secondary mixed deciduous-and-evergreen jungle on the edge of rubber plantations. One was feeding on 'Omé' berries (*Trema orientalis* Blume).

Ferguson (*J.B.N.H.S.*, xv, 461) describes it as an occasional winter visitor to the low country in Travancore and says that he has only one specimen obtained in Trivandrum. Mr. Whistler has examined five further Travancore specimens in the British Museum (Fry, Bourdillon, Anjango) with no more precise data.

It is a straggler in winter to Ceylon.

Oriolus xanthornus maderaspatensis Franklin. The South Indian Black-headed Oriole.

Specimens collected: 690 ♀ imm. 18-7-33 (Pūlayanārkotta 200 ft.); 745 ♂

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[1] I agree with this as I have watched several breeding pairs of adults during the last two seasons (Dehra Dun) in which the male could not be distinguished from the female by colour.—S. A.

imm. 29-7-33 (Kūttāni 300 ft.); 832 ♂ ad. 11-8-33 (Pūlayanārkotta 200 ft.) Trivandrum Tālūk.

Elsewhere noted at: Marāiyūr (3,000 ft.); Thattākād (200 ft.); Kottāyam (ca. S.L.); Tenmalāi (500 ft.); Trivandrum Town (ca. S.L.); Wadakkāncheri (400 ft.); Nemmāra (300 ft.); Karūpadanna (ca. S.L.).

Colours of bare parts: *Adult*: 'Iris crimson; bill horny pinkish-brown, darker at tip; mouth pale greyish-pink; legs and feet bluish; claws horny-black' (Pillai). *Immature* (Nos. 690 and 745): 'Iris blackish-grey and light blue [?]; bill slaty-black; mouth grey and pink; legs and feet blackish-grey (690), bluish-grey (745); claws horny-brown' (Pillai).

[Additional specimens examined:

Brit. Mus. Coll.: ♂ 19-11-70 Trivandrum (Bourdillon), ♂ undated Trivandrum (Fry), ♂ 8-5-77 Lower Pālnis (Fairbank).

Measurements:

	Bill.	Wing.	Tail.
3 ad. ♂♂	29-32	132.5-139.5	83-86.5 mm.
1 imm. ♂	29	133.5	86 mm.
1 imm. ♀	26	126.5	79 mm.—H. W.]

The Black-headed Oriole is a common resident species in Travancore and Cochin. It is found in the low country, usually under 500 ft. elevation, and excepting Marāiyūr (3,000 ft.)—where it was fairly common in open deciduous forest about the terraced paddy-fields in the valley—it was not met with at all in the hills. Kinloch (*J.B.N.H.S.*, xxvii, 940) also states that it does not occur in the Nelliampathy Hills at any season. In the Pālni Hills, however, Fairbank (*S.F.*, v, 406) met with it from the base up to 5,000 ft. I hazard a guess that Fairbank's statement refers only to the eastern and drier side of the hills where the facies is of a nature more suited to this species.

In Ceylon it is represented by the endemic race *O. x. ceylonensis* Bonaparte.

Breeding: There are no published records of the breeding of the Black-headed Oriole in the Travancore-Cochin area. Two of the specimens obtained by Mr. Pillai at the middle and end of July, however, were immature with —according to the collector—imperfectly ossified skulls. Both of these are in fresh first winter plumage.

Over the greater part of its range, it breeds from February to July—principally April and May (*Fauna*, iii, 12). The Ceylon race, according to Wait breeds in the island from October to May (*Nidification*, iii).

FAMILY: EULABETIDÆ.

Gracula religiosa indica (Cuvier). The Southern Grackle.

Specimens collected: 427 ♂ 9-3-33 Camp Derāmalāi 3,000 ft.; 500 ♂ 27-3-33 Tenmalāi 500 ft.

Elsewhere noted at: Mūnnār (5,000 ft.—Kanan Devan Hills); Sānthanpāra (3,500 ft.—Cardamom Hills); Thattākād (200 ft.); Ūrūmbikera Reserved Forest (ca. 1,000 ft.—near Mūndakāyam); Peermade (3,200 ft.); Kūmili (3,000 ft.—Cardamom Hills); Rājampāra (1,350 ft.—Panthalam Hills); Balamore Estate (2,000 ft.—Ashāmbū Hills); Kūriārkūtti (1,600 ft.—Annemalāi Hills); Pādagiri (3,000 ft.—Nelliampathy Hills).

Colours of bare parts: Iris brown; bill orange with yellow tip; mouth, palate yellow, gullet pink; wattles and infra-orbital skin bright yellow; legs and feet orange-yellow; claws blackish-brown.

[Additional specimens seen: 3 from Lower Pālnis (Fairbank).

Measurements:

	Bill.	Wing.	Tail.	Tarsus.
2 ♂♂	29-30	142.5-149	66-67	29-31 mm.

This race also occurs in Ceylon where its exact relationship with the Ceylon Grackle (*Gracula ptilogenys*) is not very clear. Both are birds of very local distribution in the island and in the main their ranges do not appear to coincide. This latter form is usually attributed to a distinct species because of the suppression of the wattle on the ear coverts though a division in the feathers suggests its comparativley recent suppression. As, however, the variation in the wattles is a subspecific character elsewhere and the ranges of the two birds in Ceylon have possibly been confused by the process of deforestation, it appears probable that *ptilogenys* is in reality nothing more than a race of *religiosa*.—H. W.]

The Grackle or Hill Myna is one of the commonest birds on the forested hills of Travancore and Cochin. The Survey has noted it in evergreen forest as low down as Thattākād (200 ft.) and it also occurs in the forest-clad foothills, but most abundantly at between about 1 and 4 thousand ft. elevation, and in lesser numbers up to at least 5,000 ft. It is partial to the lofty shade trees in cardamom plantations feeding on the ripe fruit of *Calophyllum wightianum* (?) and of the various species of *Ficus* scattered about these sholas, in company with hornbills, barbets, green pigeons and other frugivorous birds. Flocks of up to 20 or more birds are commonly met with. Their wings produce the same whirring sound as green pigeons' and some of their loud, sharp call-notes may easily be mistaken for those of the Black Bulbul (*Microscelis*). They also feed largely on nectar from the flowers of *Bombax malabaricum* in forest, and *Grevillea robusta* and *Erythrina lithosperma* shade trees in tea and coffee plantations. I have frequently observed pollen adhering to their chin and forehead feathers and have no doubt that they assist considerably in the cross-pollination of these species.

One bird of a pair noted at Rājampāra (16 March) had the abdomen and vent white; its mate was normally coloured.

In the Pālni Hills this Grackle is common up to 4 or 5,000 ft.

Breeding: No. 427 (9 March) had testes enlarged to 8×4 mm. and a conspicuous incubation patch, and was one of a pair. In No. 500 (27 March) the testes measured 8×5 mm. and it also had a prominent incubation patch. On 4 March a pair were observed carrying fine twigs into a hole in a dead tree-trunk standing in the Periyār Lake at a height of about 25 ft. from the surface of the water. On 20 March another pair was observed building in a hollow in a dead tree-trunk on the edge of Lahāi Rubber Estate (Rājampāra) about 40 ft. up. By this time birds were mostly in pairs when not congregated to feed, and breeding was obviously in progress generally.

According to Stewart (*Nidification,* ii, 506) the breeding season in Travancore is February to April—earliest date for eggs 6 February, latest 28 April. He says that in July some birds seem to breed again as he has taken fresh eggs on the 28th of that month. Bourdillon took a nest on 27 May. The full clutch consists of 3 eggs, but sometimes only two are laid.

FAMILY: STURNIDÆ.

Pastor roseus (Linn.). The Rosy Pastor or Rose-coloured Starling.

Specimens collected: 354 ♂ 25-2-33 Peermade 3,200 ft.; 603 ♀, 604 ♂ 16-4-33 Arāmboli 250 ft.; 953 ♂ 7-12-33 Nemmāra 300 ft.

Elsewhere noted at: Thattākād (200 ft.); Kūmili (3,000 ft.).

Colours of bare parts: Iris hazel brown; upper mandible and tip of lower mandible horny-brown, gape and rest of lower mandible pale yellow; mouth, palate yellow, gullet pink; legs, feet and claws horny-brown.

[No other Travancore specimens seen.—H. W.]

Ferguson writes (*J.B.N.H.S.*, xv, 462): 'Found in large flocks both in the low country and on the hills from September to April usually. I have seen them as late as May occasionally.' This conveys the impression that the bird is a common winter visitor, but my experience both in Travancore and Cochin shows that it is decidedly rare and uncommon in these parts. The largest flock noted by the Travancore Survey comprised of about 10 birds; parties of 3 or 4 or single individuals amongst flocks of Grey-headed and Brahminy Mynas was more usual. The two seasons during which these areas were worked did not appear to be exceptional in any way, and therefore my experience and Ferguson's statement seem rather difficult to reconcile. The explanation doubtless is, however, that as in other parts of its winter as well as breeding range its numbers vary considerably from year to year depending partly upon the abundance or otherwise of food supply, but partly also on factors which as yet we do not know.

The specimens shot or observed were feeding largely on the berries of *Lantana camara* and *Salvadora persica* and also on the nectar of *Bombax* flowers. The stomach of No. 953 (7 December) was crammed full of ripe Lantana berries exclusively. 56 seeds were recovered from the guts intact, some of which were on the point of being excreted. As I have noted elsewhere, the Pastor is undoubtedly one of the more important agents in the dispersal of this pernicious weed in India.

This bird has apparently not been recorded in the Pālni Hills. It is an irregular and uncertain winter visitor to Ceylon in small numbers.

Sturnia malabarica malabarica (Gmelin). The Grey-headed Myna.

Specimens collected: 41 ♀ 9-1-33, 97 ♂ 15-1-33 Marāiyūr 3,500 ft.; 545 ♂ 9-4-33 Cape Comorin ca. S.L.; 928 ♀ 1-12-33 Wadakkāncheri 400 ft.

Sturnia malabarica blythii (Jerdon). Blyth's Myna.

Specimens collected: 255 ♂ 9-2-33 Thattākād 200 ft.; 453 ♂ 17-3-33 Rājampāra 1,350 ft.; 762 ♂ imm. 31-7-33 (Mārūthānkūzhi 50 ft.); 821 ♂ imm. 9-8-33 (Nettāyam 200 ft.) Trivandrum Taluk.

Elsewhere noted (both forms) at: Kottāyam (ca. S.L.); Kūmili and Periyār Lake Environs (3,000 ft.); Balamore Estate (2,000 ft.—Ashāmbū Hills); Kūriārkūtti (1,600 ft.).

Colours of bare parts: Iris greyish- or creamy-white; bill yellow at tip, leaden blue at base with a greenish intervening area. In immature birds (Nos. 762 and 821) the green is replaced by brown; mouth, palate dusky yellow, gullet pinkish-grey or slaty; legs, feet and claws yellowish-brown, brownish-flesh or pale lemon yellow.

[Additional specimens seen:

B.N.H.S. Coll.: *malabarica* o? n.d. Thekadi, Travancore (Cook); ♀ 3-2-29 Kalathrupoli, Travancore (M. O. H. Beusley).

Brit. Mus. Coll.: *blythii* o? 9-3-76 Travancore (Bourdillon).

B.N.H.S. Coll.: ♂ 29-9-93 Thekadi (Cook).

The range and status of these two forms in Travancore and Cochin seem utterly confusing and it is impossible to say anything definite regarding them. The difficulty is heightened by the fact that both races may commonly be met with together and even in one and the same flock. Thus No. 928 (*malabarica*) was shot from a party which contained two or three undoubted *blythii*. In addition, there is every inter-gradation of colour between the grey-headed *malabarica* and the white-headed *blythii*, while it is practically impossible to tell females and immature males of the latter from *malabarica*.

On the whole, however, the specimens confirm that *blythii* is probably the breeding form in Travancore and that *malabarica* only appears in this area as a winter visitor. None of the specimens attributed to *malabarica* showed any gonadal development, while No. 255 (9 February—*blythii*) had its testis (only a single !) enlarged to breeding size—13×10 mm.—and 453 (17 March—*blythii*) to 10×7 mm. On 4 March, two pairs were observed building in holes in partially submerged tree-trunks in Periyār Lake which, judging from the males, were undoubted *blythii*. Several other pairs were also noted prospecting for nesting sites here between 28 February and 7 March, all of which seemed to belong to the white-headed form. A half-fledged young was brought in by an urchin on 25 March at Tenmalāi, but its parents were unfortunately not seen.

Specimen No. 545—an adult male *malabarica*—on the other hand showed no genital development on 9 April at which time *blythii* were breeding generally. Moreover it was very fat, a condition which at this season indicates in true migrants their readiness to depart. Whether it can be interpreted in the same light in the case of local migrants, as the Grey-headed Myna seems to be, is of course open to question.

In Travancore and Cochin, these Mynas frequent secondary jungle and the neighbourhood of cultivation usually in the low country and foothills, but also up to about 3,500 ft. elevation. They keep in flocks of 5 to 20 birds or more, and I found them feeding largely on *Lantana* berries, Peepal and various other *Ficus* figs and the nectar of *Bombax malabaricum* flowers. On these trees they indulge in the same sort of squabbling, chatter and bellicosity as the Rose-coloured Starling. Occasionally they were also observed springing open *Loranthus* buds and probing into them for the nectar.

Fairbank (*S.F.*, v) does not record either of these forms in the Pālni Hills, but according to the *Fauna* (iii, 41) *blythii* breeds there and is apparently a resident.

This species is not found in Ceylon.

Breeding: On the evidence obtained by the Survey nesting of the white-headed form—*blythii*—in Travancore is in progress during March and April and probably also May.

Col. Sparrow took 2 fresh eggs at Kūmili (Cardamom Hills) on 4 April. He attributes these to the grey-headed typical race, but as he did not shoot the parents, the uncertainty remains.

Stewart and Bourdillon took eggs of *Sturnia m. blythii* in Travancore in March and April (*Nidification*, ii, 519).

Temenuchus pagodarum (Gmelin). The Black-headed or Brahminy Myna.

Specimen collected: 547 ♂ 9-4-33 Cape Comorin ca. S.L.

Elsewhere noted at: Kottāyam (ca. S.L.); Arāmboli (250 ft.); Chālakūdi and in the low country along the Cochin Forest Tramway; Wadakkāncheri (400 ft.); Karūpadanna (ca. S.L.).

Colours of bare parts: 'Iris white; bill blue at base, bright yellow at tip; legs, feet and claws yellow' (Humayun Abdulali).

[Additional specimen seen:

Brit. Mus. Coll.: ♂ 6-6-77 Periakulam, E. base of Pālnis (Fairbank).

The juvenile differs from the adult in being paler and duller throughout and lacking the crest, while the pronounced shaft streaks on the hackled tips to the feathers are wanting. Cap dark sooty brown. Ear-coverts and lower parts—save for the white vent and lower tail-coverts—are warm creamy unicolorous buff. The post-juvenal moult is complete and the first winter bird cannot be distinguished from the adult. There is no spring moult. The complete autumn moult takes place in October and November. The adult female differs from the male merely in having a shorter crest.—H. W.]

The Black-headed Myna is restricted in Travancore and Cochin to the low country under 500 ft. elevation, where it frequents deciduous and secondary scrub jungle about cultivation and human habitations. Flocks of up to 8 or 10 birds were not uncommon, often in association with other Mynas, and they fed extensively on Banyan figs, *Lantana* and *Salvadora persica* berries in the usual mixed company of frugivorous birds.

In the Pālni Hills Fairbank (*S.F.*, v, 407) obtained specimens at the base and also observed it well up on the hillsides, presumably on the eastern (drier) side.

In Ceylon it is confined to the dry coastal areas.

Breeding: The specimen (9 April) was very fat and its organs showed no departure from the quiescent condition. Ferguson (*J.B.N.H.S.*, xv, 462) does not comment upon the status of this Myna in Travancore. No records of its breeding there or in Cochin exist and it may be that, as in many other parts of its range, it is only a winter visitor to the area.

Acridotheres tristis tristis Linn. The Common Myna.

Specimens collected: 227 ♂ 6-2-33, 277 ♂ 12-2-33 Thattākād 200 ft.: 534 ♂ 8-4-33, 574 ♀, 575 ♂ 12-4-33 Cape Comorin S.L.; 621 ♂ 18-4-33, 632 ♀ 20-4-33 Arāmboli 250 ft.; 711 ♂ 23-7-33 (Beach); 747 ♂ imm. 30-7-33 (Veli, S.L.); 779 ♀ 3-8-33 (Kovālam ca. 70 ft.); 839 ♀ 12-8-33 (Beach) Trivandrum Town and Tālūk; 963 ♂ 9-12-33 Nemmāra 300 ft.

Elsewhere noted at: Marāiyūr (3,000 ft.); Kottāyam (ca. S.L.); Chālakūdi; Wadakkāncheri (400 ft.); Trichūr Town; Karūpadanna (ca. S.L.); Ernākūlam.

Colours of bare parts: *Adult*: Iris brown (according to Pillai 'outermost ring greyish-white, succeeded by a ring of fine silver spots surrounding a brownish-red ring which encircles the pupil'); bill yellowish except at sides of base of lower mandible which are brownish-green; orbital skin bright yellow; mouth dark slate; legs, feet and claws yellow like bill, paler than the bare orbital skin. *Immature*: Iris 'blackish-grey' (Pillai); gape yellow; mouth more pinkish; orbital skin paler; rest as in adult. *Juvenile* (½ fledged): Iris brown; bill dusky yellowish flesh colour; gape yellowish-cream; mouth bright yellow; legs and feet pale yellowish-flesh; claws dusky.

[Measurements:

	Bill.	Wing.	Tail.	Tarsus.
7 ♂♂	25.5-30.5	139-150	81.5-90.5	38-40 mm.
3 ♀♀	26-27	138-142.5	78.5-85.5	35-39 mm.

This good series clearly establishes the fact that Mynas from Travancore are intermediate between *A. t. tristis* and *A. t. melanosternus* and some would be inclined to name them as another of the Travancore races. Compared with birds from N.-W. India they are certainly darker with a more purple tint on the lower plumage, and the white of the ventral patch is somewhat constricted. The upper parts average darker and closely resemble those of *melanosternus*. Below, however, they are not as dark as the latter and they have fewer traces of the extension of the black of the chin, throat and upper breast as a ventral band. I do not think, however, that the naming of this intermediate race would prove of value as the typical race is somewhat variable in colour and size and throughout its range a number of individuals approach these Travancore intermediates in colour. It is better to be content with the statement that while the Myna in India cannot be divided into races—as one might perhaps expect from the robust adaptability of this common bird—the fact may be remembered that it shows a tendency to develop a pale race in the extreme North-West and a saturated race in Travancore.—H. W.]

The Common Myna is an abundant and familiar resident species in the low country of both Travancore and Cochin. Apart from Marāiyūr which is in many respects an exceptional locality with a mixture of hills and plains features, it was not found at all above an elevation of about 400 ft. As elsewhere, it inhabits open country about cultivation and towns and villages.

In the Pālni Hills, Fairbank (*S.F.*, v, 407) found it common about villages at nearly 4,000 ft.

It is a common species in Ceylon.

Breeding: On 4 February (Thattākād) a pair was observed nesting in a hollow about 35 ft. up in a charred tree-trunk standing in a paddy-clearing in deciduous forest. When visited again on 6 February, this tree had been felled. Examination of the nest showed a partially fledged nestling sitting at the entrance, hale and hearty and quite unhurt by the fall! No. 277 (12 February) had testes enlarged to 8×5 mm. On 6 April (Cape Comorin) a nest was located in a hole in a palmyra palm trunk at about 20 ft., while another pair was observed building on 13 April. In specimen No. 534 (8 April) the testes measured ca. 5×4 mm. and appeared to be developing, whereas in other specimens at this time the gonads were as yet in a quiescent state. No. 621 (18 April) had testes measuring 9×5 mm., while 632 (20 April) had one hard shelled egg in its oviduct ready for laying, and the distended nature of this organ indicated that others had already been laid. Among the later specimens Nos. 711 (23 July) with testes measuring 12×6 mm. and 779 (3 August) with the largest ovarian follicle ca. 2 mm. in diameter were obviously breeding. No. 747 (30 July) was immature with imperfectly ossified skull.

Ferguson says (*J.B.N.H.S.*, xv, 462) that the Myna breeds in April in Travancore. The evidence shows that nesting operations commence about mid-January and continue till at least the first week in August and probably later, so that the breeding season in this area is a very protracted one.

Æthiopsar fuscus mahrattensis (Sykes). The Southern Jungle Myna.

Specimen collected: 172 ♂ 28-1-33 Sānthanpāra 3,500 ft.

Elsewhere noted at: Marāiyūr (3,000 ft.—more common and abundant than the foregoing species); Mūnnār (5,000 ft.—Kanan Devan Hills—abundant); Thattākād (200 ft.); Kottāyam (ca. S.L.); Peermade (3,200 ft. fairly common); Kūmili (3,000 ft.—Cardamom Hills—common); Trivandrum Town (ca. S.L.); Wadakkāncheri (400 ft.); Karūpadanna (ca. S.L.).

Colours of bare parts: Iris bluish-white; bill orange-yellow, dark brown at nostrils, gape and base of lower mandible; mouth dark slate; legs and feet yellow; claws brown.

[The one ♂ measures:

Bill.	Wing.	Tail.	Tarsus.
27.5	131.5	78	35.5 mm.—H. W.]

The statement by Ferguson (*J.B.N.H.S.*, xv, 463) to the effect that this species does not ascend the Travancore hills seems surprising, and it certainly is not correct at the present time. The Survey found it fairly common both in the low and foothills country of Travancore and conspicuously so in the hills where it occurs to the exclusion of the Common Myna. Its distribution, however, is patchy; for example it was absent in the Ashāmbū Hills and my notes do not record it from Rājampāra, Camp Derāmalāi or Pādagiri.

At Marāiyūr and in the low country, the Jungle Myna was frequently observed in mixed flocks with the Common Myna, grubbing amongst flooded fallow fields or attending on grazing cattle. They fed largely on *Ficus* figs of various species, *Lantana* berries and on the nectar of *Erythrina* (*lithosperma* and other species) blossoms. The specimen, shot off these, had a quantity of pollen adhering to its throat and tuft feathers. The tuft at the base of the culmen acts as an efficient pollen brush.

This Myna has apparently not been recorded from the Pālni Hills and it does not occur in Ceylon.

Breeding: The organs of the specimen (28 January) were in normal non-breeding condition. At Peermade, on 24 February, a pair were observed building in a hollow in a tree-trunk, 8 ft. up, in the compound of the Travellers' Bungalow, and on 4 March several pairs were busy nesting in holes in the partially submerged tree-trunks standing in Periyār Lake.

No published records of its breeding in Travancore or Cochin exist. According to the *Fauna* (iii, 58) the Jungle Myna breeds in South India from February to May and this season evidently applies to our area as well.

FAMILY: PLOCEIDÆ.

Ploceus philippinus travancoreensis subsp. nov. The Travancore Baya or Weaver-Bird.

Specimens collected: 316 ♂, 317 ♂, 318 ♀ 19-2-33 Kottāyam ca. S.L.; 678 ♀ imm. 16-7-33 (Beach); 726 ♂, 727 ♂ 26-7-33, 741 [♂?] 29-7-33 (Kūttāni 300 ft.); 785 ♂ imm. 4-8-33 (Cattle Farm 150 ft.) Trivandrum Tālūk; 913 ♂ imm. 27-11-33 Wadakkāncheri 400 ft.

Elsewhere noted at: Marāiyūr (3,000 ft.; only old nest colonies !).

Colours of bare parts: Iris hazel brown; bill horny-brown, yellowish at chin and gape; mouth pink; legs, feet and claws brownish flesh-colour. In the ♀ (318) the brown of the bill is paler.

[Measurements:

	Bill.	Wing.	Tail.	Tarsus.
4 ♂♂ adult.	18-20	70-75	41.5-48	20-21 mm.
2 ♂♂ juv.	—	68-70	40-42.5	— mm.
1 ♀	20	72.5	moult	19.5 mm.

These Weavers can certainly not be retained with the typical race. The upper plumage is much darker and browner, while the breast and flanks have a more pronounced brown wash, the shaft streaks being more defined and at the base broader than is usual in the typical race. On these features alone I am prepared to separate this as another of the peculiar Travancore forms and propose for it the name:

PLOCEUS PHILIPPINUS TRAVANCOREENSIS subsp. nov.

Type: No. 317 ♂ (breeding) 19-2-1933 Kottāyam (Backwaters), sea level. **Coll.:** Sálim Ali. Deposited in British Museum.

There is a further point of interest connected with this series. It contains 4 breeding males—in all of which the organs were enlarged—and none of these have attained the full breeding plumage as known in the typical form. The type has a yellow crown, a fairly developed black throat patch and odd golden feathers on the breast. The other three lack the throat patch and the yellow crown and have the yellow on the breast represented only by odd feathers. One has a yellow wash on the crown, the other two have the supercilium yellow. It is impossible to be dogmatic on so small a series, and the specimens may not be mature, but they suggest that in this race as in *burmanicus*, the normal breeding plumage is largely suppressed. If so, this will be a further character of the race.—H. W.]

Beyond the low country, signs of the Baya were noted only at Marāiyūr (3,000 ft.). Here, two or three small colonies consisting of from 3 to 8 disused nests each were observed suspended on mango trees amidst terraced paddy-fields in the valley lying fallow at this season (early January). From the fact that all the nests hung on the eastern side of the trees, it may be presumed that the birds nested here during the south-west monsoon and that they only came up for breeding purposes while the paddy crops were standing and departed after that function had been performed and the paddy harvested.

In the low country of Travancore and Cochin and about the backwaters, where paddy is the principal crop grown, the Baya is common and its works abundantly in evidence in the neighbourhood of this cultivation. In the dry season the birds keep mainly to the backwaters, but spread out during the monsoon over most of the low country.

In the Pālni Hills it of course does not occur, but it is found in suitable localities in Ceylon.

Breeding: Specimen No. 316 (breeding plumage; testes 8×6 mm.), 317 (breeding plumage; testes 9×5 mm.) and 318 (ovarian follicles over 1 mm. in diameter) were all shot on 19 February off a colony of about 25 nests in various stages—some completed and occupied by females, others barely begun. They hung from the fronds of a cocoanut palm (ca. 50 ft. up) in a hamlet on the banks of Vembanād backwaters. The breeding season of the Baya in this area, as elsewhere, seems to be directly correlated with paddy cultivation which provides the birds with both nesting material and food for themselves and their young. In localities where paddy cultivation is dependent wholly upon the rainy season, it is well known that nesting operations do not commence until after the monsoon has well set in and the paddy plants or the coarse saw-edged grasses which supply the building material are several inches high. In the backwaters where irrigation is perennial, paddy crops were standing at this period (middle February) ready to be harvested in about a fortnight. As soon as this crop is reaped a second sowing is made which ripens before the south-west monsoon sets in. During the monsoon months all the paddy land in the region of the backwaters is completely submerged so that Bayas can only continue to breed in this neighbourhood from early in the year up till the commencement of the south-west monsoon in May or June, or more precisely between the end of one monsoon and the beginning of the next. During the rainy season therefore the Bayas resort to the neighbourhood of the regular paddy cultivation further inland, and this is presumably the explanation for the deserted nest colony in January at Marāiyūr. Two of the July specimens (726 and 727) had enlarged organs and were ready to breed, and Pillai notes that on 4 August nesting activities were still in full swing near the Cattle Farm. Two of the July/August specimens are immature with yellow gapes and imperfectly ossified skulls.

It is evident that on account of the favourable conditions obtaining in Travancore as regards paddy cultivation, Bayas breed here practically throughout the year, most probably in shifts or relays as they become sexually mature.[1]

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[1] At my request Mr. Pillai visited the Kottayam backwaters in the middle of December (1935) in search of further breeding specimens. He found that paddy cultivation there had only just commenced and he failed altogether to come across any Bayas at that time.

According to *Nidification* (iii, 3) Bourdillon took many nests with eggs in Travancore in May and thence onwards to August.

In our experience, paddy leaf is the building material exclusively, or at least most extensively, used in Travancore and Cochin. We did not see any nests made of cocoanut fibre, as have been described, inspite of the great abundance and availability of this material. The birds are capricious in regard to the selection of sites. Cocoanut palms are largely patronised, but sometimes a couple of palmyra palms standing amidst a cocoanut grove or in its vicinity seemed to be the centre of attraction, all the nests being concentrated upon them.

Ploceus manyar flaviceps Lesson. The Madras Streaked Weaver Bird.

Specimen collected: 288 ♂ 15-2-33 Vembanād backwaters, Kottāyam.

Elsewhere not noted.

Colours of bare parts: Iris brown; bill brownish-horn, paler at commissure; legs and feet brownish-pink; claws dusky.

[Other Travancore specimens seen:

Brit. Mus. Coll.: ♂ and juv. 21-6-77 Vellarney Lake (Hume Coll.).

The Survey specimen—♂ in breeding plumage—measures:

Bill.	Wing.	Tail.
18.5	71	45 mm.—H. W.]

Ferguson (*J.B.N.H.S.*, xv, 468) describes this Weaver as confined to the plains in Travancore, where it is not common. The Survey only came across it by the Vembanād backwaters near Kottāyam where the birds were breeding and fairly numerous, though only in patches.

It is a local resident in Ceylon.

Breeding: The specimen (15 February—breeding plumage) had enlarged testes measuring 7×5 mm. and it was busy collecting strips of the coarse saw-edged grass that grows so plentifully on bunds and dykes along the backwaters. A colony of 15 nests was located on the same date among tufts of tall grass and *Pandanus* thickets growing on a small islet in the backwater, barely three yards by two. The nests were smaller than those of *Ploceus philippinus*, woven more loosely and roughly, and in texture rather resembling those of the Indian Wren-Warbler. They lacked the prolonged entrance tubes and had only slight 'porches'. Pellets of mud were plastered within as is the case with the Common Baya. The colony contained several unfinished nests in various stages, and among the birds a preponderance of males in breeding dress over females was noticed. Of the completed nests examined, one contained 3 eggs, 3 nests 2 eggs each, and 1 contained a single. Two eggs taken, measured 19×13.5 and 19×14 mm. respectively.

T. F. Bourdillon (*S.F.*, vii, 39) found thousands beginning to build in June amongst the reeds which formed floating islands in the Vellayāni Lake about 6 miles from Trivandrum. *Nidification* (iii, 9) adds that the same observer found it breeding in Travancore from July to September. These reed beds have since disappeared and with them the nesting colonies of the Streaked Weaver-bird.

I should not be surprised if, like the Common Baya, this species is also found to breed in the Travancore-Cochin area over a considerable part of the year, varying with local conditions. In Northern India birds in February and March are in eclipse plumage and breed about September. Wait (*Birds of Ceylon*, p. 115) says that the breeding season on the island is in February and March and again in June.

Munia malacca (Linn.). The Black-headed Munia.

Specimens collected: 257 ♀, 258 ♂, 259 ♂ 10-2-33 Thattākād 200 ft.

Elsewhere not noted.

Colours of bare parts: Iris brown; bill pale bluish-grey, dusky on culmen; mouth cream colour with slaty crescent and blotches; legs and feet slate; claws horny-brown.

[Other specimens examined:

Brit. Mus. Coll.: ♂ 21-6-77 Vellarney Lake (Hume Coll.).

B.N.H.S. Coll.: o?, ♀ 20-7-93 Kodaikanal (Pālnis); ♂ 31-1-01 Devicolam [Travancore] (Ferguson).

Measurements:

	Bill.	Wing.	Tail.	Tarsus.
2 ♂♂	13-13.5	55.5-56	32	16 mm.
3 ♀♀	13-13.5	53-55.5	30.5-35	16-16.5 mm.—H. W.]

The Travancore Survey only once came across a single flock of 20 to 25 birds in the vicinity of standing irrigated paddy crops in a clearing in deciduous jungle. All the 3 specimens secured were undergoing complete moult.

According to Ferguson (*J.B.N.H.S.*, xv, 468) it is only found in the low country of Travancore where flocks may often be met with especially about the backwaters. Stewart apparently found them in the hills also, to what elevation is not stated.

In the Pālni Hills, Terry (*S.F.*, x, 478) found it fairly common in the Lower Pālnis and breeding in the Pittur Valley in April. There is a specimen from Kodaikanal in the Bombay Natural History Society's Collection.

The Black-headed Munia is a locally distributed resident in Ceylon.

Breeding: The Survey procured no data on the nesting of this species in Travancore or Cochin. Bourdillon (*S.F.*, vii, 39) found it breeding among the reeds in Vellayāni Lake (near Trivandrum) in June. Stewart also obtained nests in grass fields in Travancore (*Nidification*, iii, 14) but the season is not mentioned; Ferguson gives the breeding season here as May to August.

Uroloncha striata striata (Linn.). The White-backed Munia.

Specimens collected: 314 ♂, 315 ♀ 19-2-33 Kottāyam ca. S.L.; 418 ♂, 419 ♀ 7-3-33 Kūmili 3,000 ft.

Elsewhere noted at: Thattākād (200 ft.); Nemmāra (300 ft.); Karūpadanna (S.L.).

Colours of bare parts: Iris brown; bill, upper mandible horny-black, lower bluish-grey; mouth pinkish-grey or pale yellow and grey; legs, feet and claws slate or slaty-brown.

[No other Travancore specimens seen.

Measurements:

	Bill.	Wing.	Tail.	Tarsus.
2 ♂♂	13-13.5	51-54	38	13.5 mm.
2 ♀♀	13.5	53-54	38.5-39	13 mm.—H. W.]

The White-backed Munia is, as Ferguson observes, commoner in Travancore —also in Cochin—than the foregoing species, though far from generally distributed. The Surveys came across it in the low country as well as, to a lesser extent, in the hills up to 3,000 ft. elevation. Flocks of 8 to 15 birds and smaller parties were usually observed about paddy cultivation in forest clearings, in fruit gardens by homesteads along the backwaters, and also in lightly wooded cultivated country generally.

In the Pālni Hills, Terry (*S.F.*, x, 478) found a flock in the Pittur Valley, but says nothing about its status. It is a common species in Ceylon up to 2,500 ft. and in parts up to 4,000 ft.

Breeding: Specimens Nos. 314 and 315 (19 February) were a pair building in a pollarded *Thespesia populnea* tree, about 7 ft. up, near a backwater homestead. The testes of the former measured 5×4 mm., while the largest ovarian follicle of the latter was about 4 mm. in diameter. The gonads of the other 2 specimens were in a quiescent state.

'In Travancore Stewart and Bourdillon obtained eggs from May to August, but both say that odd nests with young or eggs may be found in any month. . . . Bourdillon speaks of clutches of 8 eggs.' (*Nidification*, iii, 18).

Uroloncha kelaarti jerdoni (Hume). The Rufous-bellied Munia.

Specimens collected: 187 ♀ imm., 188 ♀ 30-1-33 Sānthanpāra 3,500 ft.; 250 ♀ 9-2-33 Thattākād 200 ft.; 671 ♂ 26-4-33 Balamore Estate 2,000 ft.

Elsewhere noted at: Marāiyūr (3,000 ft.); Wadakkāncheri (400 ft.); Pādagiri (3,000 ft.—Nelliampathy Hills).

Colours of bare parts: Iris brown; bill dark horny-brown, bluish at chin and base of lower mandible; mouth slate with pale yellow crescent on palate and patches of the same colour; legs and feet greenish-plumbeous; claws horny-brown. The immature (No. 187) differed from the adults in having the mouth cream colour, blotched with slaty and in having no greenish tinge on the legs and feet.

[A small series from Travancore (Fry and Bourdillon) in the British Museum examined, but I have omitted to note details of individuals.

Measurements:

	Bill.	Wing.	Tail.	Tarsus.
1 ♂	14	56.5	43	13.5 mm.
3 ♀♀	13-13.5	57-58	36.5-38	14-15 mm.—H. W.]

This is a fairly common resident species in Travancore and Cochin, more or less confined to the hilly portions though also met with by the Surveys sparingly in the foothills country, but not at all in the succeeding plains belt or on the coast. It frequented scrub and grassland sometimes in the proximity of cooly-lines or hillmen's settlements on the edge of jungle and tea plantations, in small parties of 3 or 4 or flocks of up to 30 or more birds.

It is apparently common in the Palni Hills. In Ceylon, the typical race *U. k. kelaarti* (Jerdon) is found in the hills above 2,000 ft.

Breeding: No. 187 (30 January) was immature with very imperfectly ossified skull and in worn juvenile plumage. No. 671 (26 April) had testes measuring 4×3 mm. and it was undergoing pre-nuptial moult. No other data in this regard was procured by the Surveys.

T. F. Bourdillon (*J.B.N.H.S.*, xv, 468) gives the breeding season in Travancore as June to August and says that the birds nest at elevations of 2,000 ft. and upwards. Six to eight eggs is said to be the normal clutch.

Uroloncha malabarica (Linn.). The White-throated Munia.

Specimens collected: 559 ♂ 10-4-33 Cape Comorin ca. S.L.; 631 ♀ 20-4-33 Arāmboli 250 ft.

Elsewhere not noted.

Colours of bare parts: Iris brown; upper mandible horny-brown, lower bluish-grey; mouth grey and pink; legs, feet and claws greyish-pink.

[Plumage too worn for measurements. No other Travancore specimens seen.—H. W.]

I can fully endorse Ferguson's statement (*J.B.N.H.S.*, xv, 469) that in Travancore this Munia is only found in the dry open country about Cape Comorin—up to approximately the Arāmboli Gap—where it is fairly common, being also the only Munia met with. It was observed in pairs, family parties or small flocks feeding on grass-seeds, etc.

In Ceylon also the distribution of this species is restricted to the dry areas in the north.

Breeding: Both the specimens (10 and 20 April) had slightly enlarged gonads. The male was in heavy general moult and the female in very worn plumage. On 19 April a bird was observed carrying building material—a grass blade—in its bill, so evidently some nesting at any rate was in progress then.

Ferguson gives the breeding season as December to March.

Uroloncha punctulata lineoventer (Hodgson). The Spotted Munia.

Specimens collected: 728 ♂ 26-7-33 (Kūttāni 300 ft.); 765 ♂ 1-8-33 (Beach) Trivandrum Tālūk and Town; 934 ♂ 3-12-33, 943 ♂ 5-12-33, 966 ♂ 10-12-33 Nemmāra 300 ft.; 1045 ♂ 30-12-33 Karūpadanna ca. S.L.

Elsewhere not noted.

Colours of bare parts: Iris orange-brown; bill slaty-black, blue-grey at base of lower mandible; mouth slaty-grey with cream-coloured crescent on palate; legs and feet bluish-slate; claws brown.

[Measurements:

	Bill.	Wing.	Tail.
5 ♂♂ (breeding plumage)	12-13.5	57-58.5	37-41 mm.
1 ♂ (brown plumage)	12.5	54	33 mm.

Additional specimens examined:

Brit. Mus. Coll.: ♀ 17-6-77, ♀ 12-6-77 Lower Pālnis (Fairbank).

I have not yet been able to work out—for lack of the necessary moulting specimens—the relationship between the brown and spangled plumages.—H. W.]

The Surveys found the Spotted Munia much more generally distributed in the low country in Cochin than in Travancore, nowhere above 300 ft. elevation, and as Ferguson says (*J.B.N.H.S.*, xv, 469) it evidently does not ascend the hills in this area. This is curious because in the Nilgiris I found several nests at Kotāgiri (ca. 6,300 ft.) in July and August, and a pair were building in the Ootacamund Botanical Gardens (ca. 7,000 ft.) on 27 September.

The birds were met with in pairs, small parties and flocks—one of over 70—in the neighbourhood of paddy cultivation in hummocky country. It was observed that the flocks in December comprised chiefly of birds in the plain brown plumage. Its food seemed to consist very largely of ripening paddy grains supplemented by grass-seeds. The crops and stomachs of the specimens were gorged with the grains. The crop of one contained 14 entire grains of green paddy, while its stomach was packed with broken pieces of the same.

Fairbank met with this species twice in the Lower Pālnis, but unfortunately does not comment upon its status there. In Ceylon it is generally distributed up to 2,500 ft. and locally to 4,000 ft.

Breeding: The July and August specimens both had testes enlarged to 6×4 mm. They were in fresh spotted plumage and evidently breeding. Of the four December specimens, Nos. 434 (3 December—testes 4×3 mm.—incubation patch !) had probably lately finished breeding. No. 943 (5 December—testes 6×4 mm.) a partial albino, was in very worn dress and moulting primaries, secondaries and rectrices. It had either just finished breeding or was changing into pre-nuptial dress. No. 966 (10 December) in plain brown plumage had undeveloped organs. Unfortunately its skull was damaged by shot which rendered age determination impossible. No. 1045 (30 December—testes 5×4 mm.—spotted plumage) was apparently breeding.

According to Ferguson, this Munia breeds in Travancore from April to July. From the evidence provided by the Survey specimens and the data collected in the field, it seems more likely that breeding continues irregularly, more or less throughout the year.

Amandava amandava amandava Linn. The Red Munia.

This Munia has not been recorded in Travancore or Cochin, but Terry found a large flock at Pulungi in the Pālni Hills in April (*S.F.*, x, 478).

FAMILY: FRINGILLIDÆ.

Carpodacus erythrinus roseatus (Blyth). The Common Indian or Hodgson's Rose-Finch.

Specimens collected: 24 ♂ 6-1-33 Marāiyūr 3,000 ft.; 105 ♂ 18-1-33 Mūnnār 5,000 ft.; 993 ♀ 18-12-33 Pādagiri 3,000 ft.

Elsewhere noted at: Sānthanpāra (3,500 ft.—Cardamom Hills).

Colours of bare parts: Iris brown; bill, legs, feet and claws horny-brown.

[Measurements:

	Bill.	Wing.	Tail.	Tarsus.
2 ad. ♂♂	14.5	85.5-87	55-59	17.5-19 mm.
1 ♀	15	84.5	—	18.5 mm.

No other specimens from Travancore seen.

The juvenile closely resembles the adult female. I have not seen the post-juvenal moult, but young birds in their first winter and summer still resemble the adult female and cannot be distinguished in any way from her.

Many males breed in this plumage but I have seen no evidence to show whether it is moulted at the second autumn between August and October or whether it is retained and adult males must be considered dimorphic.

Adults have a complete post-nuptial moult from August to October. There is no pre-nuptial moult and the plumage in consequence becomes considerably worn in summer. The female then becomes much duller and browner. The male changes considerably in appearance as a result of the wearing off of the feather edges and an apparent increase of colour owing to the prismatic effect of transmitted light on the worn surface.[1]—H. W.]

The Rose-Finch is a common winter visitor to the northern hill ranges of Travancore. Kinloch records it as fairly common in the Nelliampathy Hills (Cochin) and Ferguson found it in the High Range. The southernmost point at which the Surveys came across it was in the Cardamom Hills at ca. 10°N. lat. It goes about in small flocks of usually up to about 20 birds, frequenting scrub country on the outskirts of evergreen sholas and hillmen's settlements, and cardamom, tea and coffee plantations. The highest elevation at which the Surveys came across them was about 7,000 ft. (above Marāiyūr) in *Rubus* thickets bordering hill streams.

Their food was observed to consist largely of the berries of *Lantana camara, Maesa perrottetiana* and *Trema orientalis*—also seeds and flower buds of *Polygonum chinense* L.—while they regularly visited *Erythrina lithosperma* shade trees in coffee plantations for the nectar of their blossoms. The chin of a specimen shot off these was coated with pollen.

The Rose-Finch has apparently not been recorded in the Pālni Hills nor has it yet occurred in Ceylon.

Gymnorhis xanthocollis xanthocollis (Burton). The Yellow-throated Sparrow.

Specimens collected: 507 ♂ 4-4-33 Trivandrum Town; 560 ♂ 10-4-33 Cape Comorin; 897 ♂ 24-11-33 Wadakkāncheri 400 ft.

Elsewhere noted at: Marāiyūr (3,000 ft.); Thattākād (200 ft.); Kottāyam (ca. S.L.); Vadāserikara (ca. 400 ft.—near Rājampāra); Arāmboli (250 ft.); Nemmāra (300 ft.); Karūpadanna (ca. S.L.).

Colours of bare parts: Iris brown; bill brownish-black; mouth greyish-pink; legs, feet and claws brownish flesh colour.

[Measurements:

	Bill.	Wing.	Tail.	Tarsus.
3 ♂♂	15-17	83-86	50-53	16-17.5 mm.

Other specimens examined:

Trivandrum Mus.: ♀ 7-7-07 Arāmboli.

Also 4 Fry and Anjango birds in the British Museum without data.

The post-nuptial moult in this species is complete, and there is no pre-nuptial moult. The post-juvenal moult is said by Ticehurst to be complete.—H. W.]

The Yellow-throated Sparrow is fairly common in the drier portions of the low country of both Travancore and Cochin where it frequents the neighbourhood of cultivation and backwater homesteads, and also light deciduous jungle. In the cold weather they were observed keeping in flocks, often of considerable size, gleaning paddy grains in harvested fields and feeding extensively on *Lantana* berries and on the nectar of *Bombax* and *Erythrina* flowers in mixed avian company. At this season, large numbers usually congregated into leafy bamboo clumps or bushy trees during the heat of the day and created a great noise with their chirping. Except at Marāiyūr, it was not met with above about 500 ft. elevation. Already by the first week of February, the flocks had started breaking up, and by the beginning of April, pairs had become the rule and courtship was in progress generally.

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[1] Two males, apparently of this race, in the aviary of Sahebzada Dr. Saiduzzafar Khan (Dehra Dun) moulted at the end of October from the adult rose-coloured plumage into one closely resembling the female but with the chin, cheeks and throat a more or less immaculate vinous-buff. At the time of writing (6 December) this plumage remains unchanged although in the wild state males (at least some) may still be seen in the rose-coloured plumage. I do not find this eclipse plumage of the male recorded in the literature.—S. A.

It does not ascend the Pālni Hills, but Fairbank (*S.F.*, v, 408) found it plentiful at Periakulam near their eastern (dry) base. In Ceylon it is only a straggler.

Breeding: No. 560 (10 April) had testes measuring 7×5 mm. and it was breeding. On 12 April a pair were observed feeding young in a hollow 7 ft. up a *Thespesia* trunk (Cape Comorin) and on 13 April another nest was in occupation.

Ferguson (*J.B.N.H.S.*, xv, 469) states that in Travancore this species breeds in May and June.

Passer domesticus indicus Jardine & Selby. The Indian House-Sparrow.

Specimens collected: 53 ♂, 54 ♀ 10-1-33 Marāiyūr 3,500 ft.; 518 ♂, 519 ♂, 520 ♀ 7-4-33, 586 ♂ 13-4-33 Cape Comorin ca. S.L.; 629 ♂ 19-4-33 Arāmboli 250 ft.; 678 ♀, 16-7-33, 714 ♂ 23-7-33, 764 ♀, 767 ♂ 1-8-33 Beach, Trivandrum.

Elsewhere noted at: Wadakkāncheri (400 ft.); Nemmāra (300 ft.); Trichūr; Karūpadanna (S.L.); Ernākūlam; Cochin Town.

Noted as absent (or exceedingly rare ?) at: Mūnnār (5,000 ft.); Kottāyam (ca. S.L.); Peermade (3,200 ft.); Kūmili (3,000 ft.—none observed, but said to occupy dwellings in town sparingly); Tenmalāi (500 ft.).

Colours of bare parts: Iris brown; bill in ♂ dark horny-brown to black, in ♀ and immature pale horny-brown; mouth yellowish-pink, pink, or slaty-pink varying with age; legs and feet brownish flesh colour; claws duskier.

[Measurements :

	Bill.	Wing.	Tail.	Tarsus.
10 ♂♂	13-14.5	72-78	49-55.5	16-18 mm.
4 ♀♀	13.5-15	70.5-74	51-55	17.5-18.5 mm.

In the Eastern Ghats Survey (*J.B.N.H.S.*, xxxvi, 838) I commented on the fact that the available series of House-Sparrows from Southern India was a poor one but that as far as it went it allowed me to state that no difference either in size or colour could be distinguished between South Indian birds and birds from Northern India, south of the Himalayas. The good series obtained by the Surveys has now confirmed that view. The Travancore birds agree in colour, state for state, with my Punjab series and there is no appreciable difference in measurements:—

	Bill.	Wing.	Tail.	Tarsus.
8 ♂♂ Punjab	13.5-14	72.5-78	51.5-57	17-18 mm.
4 ♀♀ Punjab	14-15.5	72.5-77.5	53-54.5	17-20 mm.

In the Sparrow the post-juvenal moult is complete. There is no spring moult and the autumn moult is complete. The juvenile plumage is too well known to require description.—H. W.]

The distribution of the House-Sparrow in this area is curious. It is fairly general in the low country of Cochin, but becomes inexplicably patchy and capricious in North Travancore as will be seen from the gaps indicated above. In the low and coastal country of South Travancore it is common. Excepting at Marāiyūr—and possibly at Kūmili—both along the highways of communication between Travancore and the adjoining drier districts of Madras Presidency through the barrier of the ghats that separate them, it was not met with above an elevation of about 500 ft. Wherever present it was, of course, as a commensal of man.

In the Pālni Hills, Fairbank (*S.F.*, v, 408) found House-Sparrows in villages up to 5,000 ft. altitude. The same race, *indicus*, is abundantly resident in Ceylon.

Breeding: In the first week of January (1933) House-Sparrows were observed breeding commonly among the rafters and thatching of the huts in Marāiyūr village. The organs of Nos. 53 and 54 (10 January) confirmed this; the testes of the former measured 5×4 mm., while the ovarian follicles and distended oviduct of the latter indicated that it had lately finished laying.

Of the April specimens, only 586 (13 April) with testes enlarged to 7×5 mm. was breeding, while in 519 (7 April) the testes were slightly developed (3×2 mm.) although its imperfectly ossified skull showed that the bird was as yet immature. In the second week of April, however, Sparrows were nesting freely in holes in the masonry sides of the Travellers' Bungalow well at Cape Comorin. This was also observed to be the case in the frontier Customs station at Arāmboli on 14 April.

The gonads of three of the July/August specimens indicated that breeding was still in progress at that time. In No. 714 (23 July) the testes measured 9×4 mm. while the largest ovarian follicle of 764 (1 August) was about 3 mm. in diameter.

On 3 January (1934) nesting was in progress on cornices etc. in the Guest House at Ernākūlam, and on the same date similar activity was noted in and about the historic synagogue of the White Jews in Cochin Town.

Ferguson says (*J.B.N.H.S.*, xv, 469) that the Sparrow breeds in Travancore in February and March, but the evidence shows that there is no definite season and that it does so more or less throughout the year.

FAMILY: HIRUNDINIDÆ.

[**Delichon urbica** (Linnaeus). The House-Martin.

Not met with by the Surveys, neither recorded from this area by previous observers, but there is a specimen labelled 'Travancore' from Surgeon-General Fry in the British Museum with no more precise date. It is open to doubt whether this specimen was actually procured in Travancore or purchased from some dealer there, or perhaps even mislabelled.]

Riparia concolor (Sykes). The Dusky Crag Martin.

Specimens collected: 597 ♂ 15-4-33, 620 ♂ 18-4-33 Arāmboli 250 ft.: 886 ♂ 20-11-33 Kūriārkūtti 1,600 ft.

Elsewhere noted at: Pādagiri (at ca. 3,000 ft.—Nelliampathy Hills).

Colours of bare parts: Iris brown; bill blackish-brown; mouth pale flesh colour; legs and feet pinkish-brown; claws horny brown.

[Measurements:

	Bill.	Wing.	Tail.
3 ♂♂	10-11	109.5-112.5	45-46 mm.

This is an extension of range as the Dusky Crag Martin was not previously known to occur south of the Nilgiris where according to William Davison it is found at all elevations as a not uncommon winter visitor, a few birds staying to breed.—H. W.]

The Dusky Crag Martin has not been recorded from the Travancore-Cochin area before. It was found to be very locally and patchily distributed in the low country as well as hills, and far from common. The birds were usually observed hawking insects in company with Common or Spine-tail Swifts over steep grass-covered hillsides with sheet rock or cliffs and scarps, up to about 5,000 ft. elevation.

The species has not occurred in the Pālni Hills and it does not extend to Ceylon.

Breeding: The testes of specimen No. 597 (15 April) measured about 3×2 mm., those of the other two (20 November and 18 April) being in a quiescent state. Both the April birds were undergoing complete post-nuptial moult. No. 620 (18 April) was one of a pair which had a nest on an inaccessible ledge of rock, ca. 40 ft. up, in the hills bordering the Arāmboli Gap. The contents of the nest could not be ascertained, but from the fact that the owners visited it every now and again, and their actions while there, I presume that it contained fairly grown young which the parents were feeding.

Elsewhere in its range, the Crag Martin breeds largely in February and March.

Hirundo rustica gutturalis Scopoli. The Eastern Swallow.

Specimens collected: 289 o? 15-2-33, 299 ♂ 17-2-33, 305 ♂ juv. 18-2-33 Kottāyam (Vembanād Backwaters); 529 ♂, 530 ♂ 7-4-33, 578 ♂ 12-4-33 Cape Comorin; 1012 o? juv. 25-12-33 Karūpadanna ca. S.L.

Elsewhere not noted.

Colours of bare parts: Iris brown; bill, legs, feet and claws blackish-brown; mouth pinkish-yellow. In juvenile (No. 305) bright yellow.

[Additional specimen seen:

Brit. Mus. Coll.: ♀ 28-2-80 Quilon [Travancore] (Bourdillon).

In the Swallow, both in the typical race and in *H. r. gutturalis*, to which I attribute these specimens from their small size and broken breast band, both the post-juvenal moult and the post-nuptial moult of the adult are complete and appear to take place somewhat irregularly and slowly, occupying the greater part of the winter. There is no time for a spring moult as some of these specimens have still not completed their moult by April.

These specimens (adults and juveniles) are all, except No. 289 which has finished, in different stages of their moult and so cannot be measured.—H. W.]

The Surveys found this Swallow fairly common in the neighbourhood of paddy cultivation in the low country, especially the coastal region and about the backwaters, both in Travancore and Cochin. Ferguson (*J.B.N.H.S.*, xv, 470) describes it as a winter visitor to the *low* country in Travancore (and not *hill* country as is inadvertently stated in the Eastern Ghats Report, *J.B.N.H.S.*, xxxvi, 840). The birds were most abundant about the backwater paddy-fields where they were to be seen either perched on the tall grass stems or dyke stakes, or hawking insects over the standing crops or the surface of the water.

This species is a winter visitor to Ceylon.

The gonads of the specimens were in a quiescent state. No. 529 (7 April) was very fat suggesting that it was more or less ready to emigrate.

Hirundo javanica domicola Jerdon. The Nilgiri House-Swallow.

Specimens collected: 38 ♀, 39 ♂, 40 ♀ 9-1-33 Marāiyūr 3,500 ft.; 663 ♂, 664 o? juv., 665 ♂, 666 ♂ juv. 25-4-33 Marūthānkūzhi 4,000 ft. (Ashāmbū Hills); 1001 o?, 1002 o? 20-12-33 Pādagiri 3,000 ft.

Elsewhere not noted.

Colours of bare parts: *Adult*: Iris brown; bill brownish-black; mouth yellowish-pink; legs and feet horny-brown; claws like bill. *Immature*: Iris brown; bill horny-brown, yellow at gape; mouth and gape yellow; legs and feet pinkish-brown; claws horny-brown.

[Measurements:

	Bill.	Wing.	Tail.
2 ♂♂ ad.	10.5-11	103-104.5	46.5-47 mm.
2 ♀♀ ad.	10.5	103.5	44.5-45 mm.
3 juvs.	—	100-101.5	42-42.5 mm.

The juvenile is very similar to the adult but the upper parts are less metallic, the chestnut forehead is less defined and the chestnut of the chin, throat and breast is softer and paler. The rest of the lower parts are faintly washed with pinkish-white. The tertiaries and their coverts and the lower tail coverts are broadly edged at their tips with pinkish white. The outer tail feathers are blunter at the tip.

This good series confirms the distinctness of the South Indian race which differs from the typical race in the smaller bill and the greener gloss of the upper plumage.—H. W.]

The lowest elevation at which the Surveys came across the Nilgiri House-Swallow was about 3,000 ft. (Marāiyūr), and as Ferguson says (*J.B.N.H.S.*, xv, 470) it is usually found at 4,000 ft. and upwards in the hills of both Travancore and Cochin. Kinloch (*J.B.N.H.S.*, xxix, 564-5) records it from the Lily Downs of Cochin, ca. 4,700 ft. The birds were met with in fair numbers hawking insects over grassy hillsides and on the edge of tea plantations. No. 666—a juvenile—was observed being fed by its parent in mid-air.

This swallow probably occurs in the Pālni Hills, but there are no records thence. It is a resident in the Ceylon hills.

Breeding: The gonads of the specimens furnished no indication as regards breeding, but skull examination and colours of bare parts showed that two of the birds procured on 25 April were juvenile and evidently lately out of nest.

According to Bourdillon (*J.B.N.H.S.*, xv, 470) the breeding season in Travancore is March, April and May. It builds its mud nest, well lined with feathers, usually singly and not in colonies, under the eaves of a house or even against a rock. 1 to 3 eggs is said to be the normal clutch.

Hirundo daurica erythropygia Sykes. Sykes' Striated Swallow.

Specimens collected: 92 ♀ 14-1-33 Maraiyūr 3,000 ft.; 279 ♀, 280 ♀ 12-2-33 Thattākād 200 ft.; 638 ♀ 21-4-33 Arāmboli 250 ft.

Elsewhere noted at: Kottāyam (S.L.); Camp Derāmalāi (3,000 ft.—Panthalam Hills); Wadakkāncheri (400 ft.); Karūpadanna (ca. S.L.).

Colours of bare parts: Iris brown; bill, legs, feet and claws dark horny-brown (in No. 92 with a pinkish tinge); mouth pinkish-yellow.

[Measurements :

	Bill.	Wing.	Central tail feathers	Outer tail feathers
4 ♀♀	10-11	110-116.5	40-43.5	71-79 mm.

These 4 specimens have the chestnut rump-band slightly richer in colour than is usual, but I am not satisfied that this difference is of subspecific value. It is very slight in degree and the colour of the rump-band is apt to vary with wear and bleaching.

No other Travancore specimens seen except one in the British Museum without data from Surgeon-General Fry.—H. W.]

Sykes's Striated Swallow is fairly common in the low country of Travancore and Cochin and was also met with by the Surveys sparingly and capriciously in the hills up to about 3,500 ft. Ferguson (*J.B.N.H.S.*, xv, 470) shot a specimen in the High Range at over 5,000 ft. and Kinloch (*ibid.*, xxix, 564-5) records it ('*nepalensis*') on the Lily Downs of Cochin at about the same elevation.

In the Pālni Hills, Terry (*S.F.*, x, 469) saw this species at Pulungi in April. It is a rare straggler to Ceylon where the chestnut tinted *H. d. hyperythra* Layard is the resident form.

Breeding: Nos. 279 and 280 (12 February) had conspicuously granular ovaries which, with their more or less immaculate plumage, suggested that they were ready to breed shortly. No published record of its breeding in Travancore or Cochin exists, however, and the *Fauna* (iii, 251) even describes this bird only as a winter wanderer into our area.

Hirundo daurica subsp.?

Specimens collected: 1021 ♀, 1022 o?, 1023 o? imm., 1024 ♂ 27-12-33 Karūpadanna ca. S.L.

Elsewhere ?

Colours of bare parts as in the foregoing.

[These 4 swallows are all immature and by their measurements (wing: 114.5-117.5, central tail feathers: 37.5-43, outer tail feathers: 76.5-90 mm.) are evidently not *erythropygia*, for it will be remembered that the tail in the juvenile is always shorter than it will be in the adult. Correctly sexed young birds from the breeding ground of the various races are too rare in collections for me to have worked out the differences between the immature birds of different races, but these agree with other young birds found in India in winter which I have hitherto (provisionally) called *nepalensis*.—H. W.]

These swallows were shot out of a vast concourse of several hundred (or thousand ?) birds that collected morning after morning on some telegraph wires near the Travellers' Bungalow. They began assembling at about 7 o'clock and flew about in dense shoals or sat huddled together for over two furlongs of the line, all facing the sun and preening themselves. By about 9 or 9-30 they had usually all dispersed to feed. None were to be seen on the wires in the evenings and it was observed that the birds all retired to roost for the night among the reeds on small islets in the backwaters, which were white with their droppings.

(*To be continued*).

HOG-HUNTING REMINISCENCES.

BY

J. C. A.

During the half century of the life of the Bombay Natural History Society no articles on pig-sticking—that is more realistic than hog-hunting!, have appeared in the *Journal*; so these reminiscences, dating back to 1889, may be of interest to readers, especially those new to the country.

Forty-six years is a long time to look back; yet do I most vividly recollect that tense moment when I first viewed 'the great grey boar'. 'There was something close to the water's edge, and my heart with one leap stood still,'—What a pity it is there was no poet in those days of the like of Lindsay Gordon to record in splendid verse the joys of the King of all Sports; though this is said in no carping spirit against the great epic song of the Hog-hunter, which will aptly find a place in these pages before we lay aside our phantom spear.

That first encounter with the redoubtable foe was soon after I entered upon the glorious life of an Indigo Planter in Tirhoot, that level, cultivated, country which lies between the mighty Ganges and its great tributary the Gandak river bringing icy floods from the snowy ranges of Nepal.

My Factory Manager was a splendid horseman and a noted G.R., for despite his inches—he was over six feet, he was thin as a lath so rode about 9 stone 10 pounds. Rightly could it be said of 'Bob' Crowdy—he raced under the name of 'Mr. Bob':—

'A rider unequalled, a sportsman complete,
A rum one to follow, a bad one to beat.'

Many are the tales which could be told of his reckless ways of putting even his racehorses and chasers into a trap without previous training; and as often as not he would scorn the high road and take short cuts across country to the terror of any less venturesome companion who might be with him. A dangerous man indeed to be alongside of! A counterpart he was of the famous John Mytton.

With such a chief, it was not long before I possessed a modest stable and entered into the varied sports of those days. It was on a pretty warm morning in the early part of May that six of us were out in pursuit of pig. We were beating some '*ijer*' jungle, consisting of fair-sized trees which favour low-lying, swampy, ground. E and I were together, as we separated ourselves into three heats. Some time after the beat started a fine old grey boar broke on our side, and giving the usual 'law' we raced after him, but before we got on terms he went into a deep nullah in which were some wild rose bushes standing in water. Nothing would induce him to show, though his grim form could be dimly made out in the not very thick cover.

In the meantime Bob Crowdy's heat came along and 'Take the shot gun and tickle him up' was the instruction to me, the novice at the game. So, the gun taken from an attendant, it seemed simultaneous with the arrival of the insulting pellets that the boar had floored my pony and myself! Fortunately for us, when we recovered from the mix up, the pig had spotted one of the beaters and made for him. The man had the presence of mind to throw himself flat on the ground, and before any damage could be done Crowdy rode up and pricked the boar with his spear; he dared not spear heavily for fear of injuring the man. At this fresh insult the boar charged and Crowdy failed to stop him, not having any pace, and got his horse cut below the hock: then there was a general melée and the gallant fight was over.

My pony had been caught and brought to me, so I was in at the death of my first pig! Not indeed mine by virtue of 'first spear', but had I not tickled him up with the shot gun? And how soon had I learnt that the prowess of the great grey boar was no whit exaggerated.

In those days ponies were cheap to buy, and keep, so I soon owned some useful nags. The Sonepore Fair, where to this day you may buy anything from an elephant to a mouse, or an eagle to a quail, was perhaps the greatest event of the year. There was a great gathering of the planting community from far and near, to enjoy the ten days of business and pleasure for all and sundry assembled from most parts of India.

Wandering around on an elephant, the camps and native quarters could be seen to great advantage. There were streets of shanties rigged up as shops for sale of all sorts of goods; groceries, toys, curios, various liquids in many-coloured bottles; silks, muslins, beds, tables, and every conceivable article of furniture; carriages, carts, conveyances of all sorts. Doubtless in these days there will be bicycles and motor cars; and soon there will be aeroplanes!

Beyond the tents was the horse fair to which dealers, even from far Afghanistan, brought animals of every quality for sale. Good, sound, nags could be had, but the buyer needed his wits about him for he was bargaining with some of the most astute horse-copers in the world.

It used to be a great sight to watch the many elephants being bathed in the waters of the Gandak, just as one sees them near Kandy in Ceylon and at other places at the present day. Lying down in the water they are well scrubbed with a brick, then over on the other side, obedient as any child, and when that has been well cleaned, off to the sugarcane mart and away to camp for a feed for man and beast.

It was the Kabuli horses that we younger planters used to buy, they being cheap as well as strong and hardy: round about Rs. 200 is what they cost us. There was racing on four alternate days, with a ball kept up until a late hour in the same evenings; and the evening drive round the race course when all Sonepore used to put in an appearance; and the polo and tennis and endless jollifications: what a hectic time of it we lads used to have! I wonder if the great mango grove of a hundred acres is still as it used to be, affording welcome shade to the great concourse of canvas.

But let us get along to the best part of those days; the pig-sticking and hunting of jackal, wolf and fox. It would be wearisome to relate the happenings of many hunts, but there are incidents which stand out in the memory. One such was the day when an elephant was cut about a foot below the root of the tail! You would not think that possible? This was the way of it.

On the day of that memorable incident four spears were out, and a fifth man was on an elephant with a shot gun, for the ground to be beaten was covered in heavy thatching-grass. The line of beaters started a fine boar. He broke just under my pony's nose: we nearly trod on him. A real fighting pig he was, and we were unable to get him out of the grass. As he lay up and would not show himself the elephant was called up to push him out, but the pig turned the tables on the *hathi* for he instantly charged; and as the elephant turned tail gave him two good cuts on the leg. On receiving these hasteners the frightened elephant stumbled for some cause and half sat down—which was the pig's opportunity to give him a real swipe of a cut in a nice soft place! Our pal with the gun fell off, almost on top of the pig, but Crowdy near by covered the fallen warrior with a spear, so enabling him to get clear without damage. But the pig got home on C's horse and cut him badly in the hock; yet, even in that thick stuff, Crowdy managed to get in a mortal spear so that fighting boar died without a sound.

As we all know, the throwing of a spear is a very dangerous thing. An excitable member of our community twice did this when out with me. We were riding a small boar which had broken cover and made for some '*jhow*' in a river bed. Seeing the pig escaping into this G, old hand though he was, hurled his spear at the vanishing porker: the spear rebounded and cut the thigh of a cooly near by, for the turn of the hunt had taken us towards the beat. Fortunately it was not a serious wound, but it might have been.

That incident, however, was insufficient brake upon the excitable temperament of my friend, for a month later, when two nice boars broke and we were hard after them they jinked back and made for cover. We had cut out the larger of the two and were riding him for all we were worth, but the distance was too short. G stood up in his stirrups and hurled his spear at the disappearing pig; the spear point imbedded in the ground and G rode on to the leaden butt which caught him a heavy jolt over the liver. Lucky it was not the business end! He is not long gone to other hunting grounds, for he died about three years ago.

Pig-sticking risks are many and various. Buffalo wallows concealed in the long grass, the deep foot-marks dried in the fierce sun, were always a potential danger. One of us had a fall in one of these, and being spread-eagled in front of his mount, the spear still fast in his hand and the point backwards, speared the mare in the neck; a deep wound. As often as possible we used to have a Native Veterinary Assistant out with us and he was fortunately handy; so the wound was quickly seen to, and healed in about a month.

An accident which happened in Purneah, next country to ours, created a great stir at the time. G.-W and another, B, were riding a pig. B was on the pig and came down in the blind going. G.-W close behind saw this and tried to pull out, but his horse also came down and he was thrown on the point of B.'s spear which entered under the left breast and came out under the left shoulder blade. Instead of being instantly killed or mortally wounded, as one would imagine, no serious damage was done! The spear could not be pulled out from the front so was straightaway cut off close to the chest and pulled out from the back. Within a month the wounded man was fit and well, a most marvellous recovery from an apparently fatal wound. He rode pig afterwards and died twenty-five years later from causes unconnected with the injury.

One day, when we were all having a rest and a drink, with the half dozen beating elephants taking their ease a short distance behind us, there was a sudden uproar among the animals. A fine tusker, whose mahawat had left him for some purpose of his own, rushed at another, overthrew him by the unexpected assault, and savagely prodded him with his tusks, one of which penetrated deeply behind the elbow. The missing mahawat rushing up with a stick in his hand, belaboured the offender to the accompaniment of a fine vocabulary of abuse and actually beat him off in that way, while the other elephant attendants had been powerless to make the brute desist from his attack. The poor beast died a month later from his injury.

It is a common saying that 'where a pig can go a horse can go' and this is almost literally true; but sometimes it is not possible. The deep fissures of the parched alluvial soil, much of it very blind owing to high grass and scrub, were always dangerous, but it was surprising how seldom bad falls occurred over such ground. It was the pace that did *not* kill, for in speed lay safety for man and beast, as all who have experience well know. Sometimes horses used to be badly staked by the sliced tops of cut crops such as '*arhar*', castor oil, and the like; and on one occasion a horse lashing out at a pig tore off the tush which remained imbedded in the soft part of his heel!

Bees sometimes caused a complete dispersion of sportsmen and beaters, the unfortunate animals suffering much on such occasions as they were unable to dive into the thick foliage of some bush, or to cover vulnerable spots with a portion of clothing. Their only protection lay in maddened flight which sometimes extended to miles.

The vitality of the wild boar is extraordinary, and I once saw a pig take thirteen spears before succumbing without a sound. Of course a good spear in a fatal spot is speedily fatal—but every spear is not so delivered.

There were two kinds of boar in our country, at least so we non-naturalist pig-stickers considered; and they had different dispositions, the grey being the more fierce and pugnacious. A vicious and implacable foe when roused he always showed better fight than the black variety which would sometimes utter a dying squeal, which the grey boar never did. The two differed much in the slope of the skull, that of the black pig being high over the frontal bone and not very deep in proportion to length while the grey boar had a skull not markedly high but long, and receding in proportion to height. The black boars grew to a great size and the grey were, on the whole, smaller and more slightly built animals. The young of the grey pig were striped at birth, whereas those of the black were unstriped and of uniform black colour.

With an incident which might have been a tragedy I will end these sketchy reminiscences. G and B were in one heat, and W and self on the other side of the cover. The boar headed for the railway embankment, G and B on his tail. The line being of recent construction was unfenced. W and I having followed on arrived as the pig was speeding up the slope. G was met as he topped the edge of the embankment by the charging pig and delivered a good spear, rolling the animal down into a borrow pit. Almost in the act of spearing a train thundered by within a few feet of the excited rider. What a mess there might have been!

Now let us sing the good old song. No heel taps!

I would like to sing, but, I am sorry to say, I cannot accurately give the words of 'The Great Grey Boar' and do not know where to find the correct version.

It is fitting to close with those lines of Lindsay Gordon's in 'The Sick Stockrider':—

> In these hours when life is ebbing, how those days when life was young
> Come back to us; how clearly I recall
> Even the yarns Jack Hall invented, and the songs Jem Roper sung;
> And where are now Jem Roper and Jack Hall?

ON THE BIRDS OF THE KISHENGANGA VALLEY, KASHMIR.

BY

MAJOR R. S. P. BATES, M.B.O.U.

ITINERARY.

April 16. Arrived Domel (2,200 ft.) by the Abbottabad route.
,, 18. Domel to Pateka (2,670 ft.). 15 miles.
,, 19 to 21. Remained at Pateka.
,, 22. Pateka to Dhanni (3,200 ft.). 10 miles.
,, 23. Dhanni to Tithwal (3,487 ft.). 8 miles.
,, 24. Remained at Tithwal.
,, 25. Tithwal to Salkalla (4,500 ft.). 17 miles.
,, 26 and 27. Remained at Salkalla.
,, 28. Salkalla to Keran (4,990 ft.). 10 miles.
,, 29 to May 6. Remained at Keran.
May 7. Keran to Reshna (5,900 ft.). 14 miles.
,, 8. Reshna to Sharda (6,130 ft.). 13 miles.
,, 9 and 10. Remained at Sharda.
,, 11. Sharda to Kel (6,544 ft.). 14 miles.
,, 12 and 13. Remained at Kel.
,, 14. Kel to Janwai (6,906 ft.). 15 miles.
,, 15 and 16. Remained at Janwai.
,, 17. Janwai to Taobat (7,400 ft.). 14 miles.
,, 18. Taobat to Badwan (Gurais) (7,900 ft.). 14 miles.
,, 19. Remained at Badwan.
,, 20. Badwan to Bagtor (7,700 ft.). 9 miles.
,, 21 to 29. Remained at Bagtor.
,, 30. Bagtor to Koragbal (8,400 ft.). 5 miles.
,, 31. Koragbal over the Razdhainangan Pass (11,586 ft.) to Tragbal, and thence to Bandipur and Srinagar on June 1 and 2.

NARRATIVE.

Ornithologically the Kishenganga is little known for the simple reason that the easiest and usual way of exploring Kashmir's many valleys is to go direct to Srinagar to arrange kit, supplies, and transport and to commence explorations thence. The route from Srinagar to Gilgit certainly traverses the extreme upper end of the valley through Gurais, but the stretch of the Kishenganga flowing through that very beautiful district comprises but one twelfth of its length from the junction of the Tilel and Burzil streams to the river's confluence with the Jhelum at Domel.

My wife and I had always longed to see Gurais, so the idea of combining a visit there with a study of the Kishenganga's birds proved an irresistible attraction in spite of a number of disadvantages in the scheme, the main one being that I had to take my leave from April 15 to June 14. This I knew before we started to be, even in normal times, a good month too early for my purpose, but the weather in the first half of April this year was most unusually wet and cold. The result of course was to all intents and purposes that we were always moving up about three marches behind the snow level. In consequence practically none of the birds which I particularly wished to study and photograph, with the exception of three or four very early breeders, had begun to contemplate nidification. This made it almost impossible to separate residents from migrants and to determine exact breeding limits.

The itinerary given above will I trust give the reader some idea of our travels but it requires amplification.

We arrived at Tret on the evening of April 14 to hear that the Murree-Kohala road was entirely blocked by snow and landslides and certain to remain blocked for some days. The following morning we gloomily retraced our steps to Rawalpindi only to find that the road via Abbottabad was also breached five miles or so from Domel, but feeling that a possible walk of five miles could not be allowed to interfere with our programme, we set off forthwith and reached Garhi Habibullah the same evening. By next morning the road had been cleared, and in consequence we were soon at the Domel Dak bungalow. Alas! a telegram there intimated that servants and supplies coming down from Srinagar were held up indefinitely by further slips near Uri.

To enable a start to be made at the earliest possible moment, I went off to the Thesildar at Muzzaffarabad to arrange transport, either coolies or ponies. Ponies, I was informed, are not to be had in the lower Kishenganga. Mules are used but the Thesildar was not optimistic. The heavy rain had played havoc with the track—it can hardly be called a road—along the Kishenganga, and an important bridge across a side nullah had also been swept away. He arranged to send us 26 coolies which he said could not possibly be expected to turn up before 11 o'clock on the 18th. It being then the 16th, I banked on our kit arriving and fixed up accordingly.

The following morning a worried Zaildar called upon us. His object was apparently to dissuade us from attempting the journey upon which we had set our hearts. I think he was afraid for my wife, but he did not know her determination nor that she is undoubtedly surer of foot than I am. Besides, it is extraordinary what one can accomplish when the only alternative is to go back all the way one has come. There are few routes over the hills out of the Kishenganga Valley and they are almost impracticable until well on into May. According to the Zaildar the path was so awful that we might reach Tithwal, only three marches up the Valley, in a fortnight or three weeks. Actually we were there in less than a week but nevertheless he was right about the state of the track, and after those first three marches we both felt quite competent to take on any goat over ground of its own choosing.

Our kit fortunately turned up on the 17th, so by the following morning everything had been sorted out and repacked into fifty-pound coolie loads in time for the proposed start. The promised coolies did commence to appear roundabout 11 o'clock, but they were a very mixed crew. A good hour and a half was wasted wrangling over loads and it required a vigilant eye to see that each coolie had anything like a full one, added to which the coolies of these parts carry their loads unroped on their heads or shoulders instead of across their backs in a sensible manner. A string of gurgling camels would have been easier to deal with. It was long after midday before a start could be made.

The dak bungalow compound was seething with migrants. The previous day had seen the trees filled with Grey-headed Flycatchers and Willow-Warblers. The former had passed on but shimmering white streaks of beauty now proclaimed the place alive with Paradise Flycatchers, and just as we started a flock or five or six Black-throated Thrushes arrived, but whether the latter were bound up or down the valley I cannot say.

Birds seen at the beginning of this march were mainly those of the lower levels and plains including Jungle Crows, Common Mynas, White-cheeked Bulbuls, Drongos, Indian Bushchats, and by the river a couple of White-breasted Kingfishers, Himalayan Whistling Thrushes, many Plumbeous and White-capped Redstarts, and to my surprise on a patch of boulders a mile or so beyond Muzzaffarabad a Pied Chat. A second one was seen a little way further on.

A couple of miles or so from Domel the Kishenganga roars from a gorge of thoroughly impressive dimensions, and from there for over thirty miles to Tithwal it can be said with truth that the valley is but a narrow gash in the mountains with a precarious path scratched out on its flank, sometimes high above the seething water; sometimes, but not often, approaching nearer its surface. From Tithwal to Keran the hillsides are perhaps less precipitous; again a gorge to Dudhnial, but inclined to be more often slightly less enclosed from there to Gurais. But throughout its entire length the river has cut a series of deep gorges with occasional fans and flattened spurs where large side streams flow in. Here of course are the villages, usually consisting of but a few houses, the inhabitants of which eke out a precarious existence by terracing every available spot into narrow fields in which they grow maize, corn, and to a lesser extent rice, maize being to all intents and purposes the sole crop from Keran upwards, in spite of the fact that Keran is only 5,000 ft. above sea level. The severity of the zemindar's lot is reflected in their weather-beaten faces and ragged clothing, and certainly in the lower reaches they struck me as being an under-nourished meagre race. The coolies of the lower tracts were a poor lot after the sturdy Kashmiris, and a thirteen-mile march with a fifty-pound load took them all day to accomplish.

At the eighth mile from Domel, at Ghori, the river is spanned by a suspension bridge. As far as this the road, a ledge cut for the most part in the gorge side, was in an execrable condition but by no means impassable. Numerous slips had occurred with abrupt slides straight into the river beneath, and across these a path a foot or so wide had been trodden. The first few were unpleasant to negotiate but there were so many that we quickly got used to them. From Ghori to Pateka the path was on the left bank and crossed one or two spurs so was not so often abruptly over the river.

From Ghori too the country began to show a definite change. Bushes had certainly become more numerous and taller, but now open woods of long-leafed pines began to make their appearance on the southern bank, though these were mainly high up the mountain sides. It was not until the next march that the woods definitely grew down to the river's edge.

At Pateka I at once noticed Striated Swallows flying around the forest rest-house. We also heard Nightjars there but I failed to collect a specimen. They had the extraordinary habit of hawking insects at dusk high overhead well out of gunshot over the two stoney nullahs on either side of the hut. I failed to discover them in their daytime haunts and a nighttime expedition with an electric torch likewise drew blank.

From Pateka to Dhanni, a distance of but ten miles, took us all day, three coolies not getting in until nearly dark. First we had to negotiate a rushing torrent where the bridge had been destroyed, and shortly afterwards we were faced with a slip between three and four hundred yards wide where the whole hillside had literally fallen away. It was not as terrifyingly steep as it might have been, but rocks jutted out awkwardly in the worst places and slipping shale splinters made it necessary to go quickly for yards at a time, an unpleasant proceeding where the 'path' was but a series of imprints of coolies' naked feet. Our difficulties were further increased by our two dogs who would insist on trying to walk side by side. The cocker in one place developed cold feet and made an effort to get back along the path to his mistress past those who were leading.

At Dhanni Striated Swallows were again in plenty, so I did not add to the only specimen I had collected at Pateka, expecting to meet with them further on when building operations had commenced. Alas! we saw no more after entering the Tithwal gorge. 3,200 ft. seemed to be the limit of this race. I also ascertained that the Common Swallow was unknown in the valley. The Zaildar at Pateka was able to describe quite accurately the nesting of the Striated Swallow and told me they would have eggs in twenty days' time but said no Swallows ever built in the houses, and certainly I never saw one after leaving Domel.

Dhanni to Tithwal was an easy march, the latter half being through a very beautiful gorge. There were now a few trees on the right bank as well as scrub, and deodars with their graceful drooping boughs and symmetrical outlines made their appearance amongst the pines. Wild pear in blossom and some kind of fig tree also added their quota to the flora. Flocks of Blue Rock-Pigeons inhabited the craggy banks, and I was surprised to see a Large Cormorant wing its way swiftly down stream.

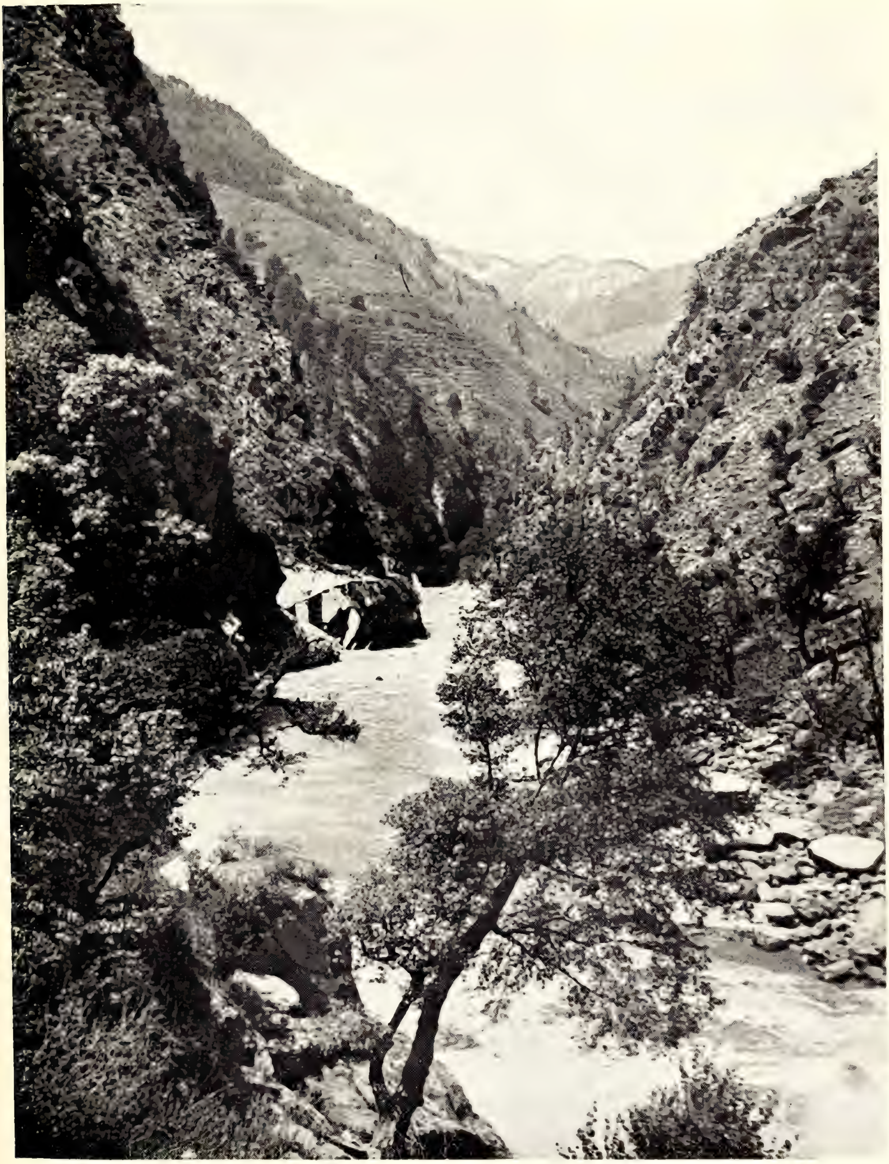
Tithwal, apparently usually called Karnah, was hot; the high hills enclosing it on all sides reflected the sun's rays as in a funnel, and we were pleased to quit it after a day's halt. There was an isolated colony of Common Mynas there and also a few House-Sparrows. No more of either were seen throughout the length and breadth of the valley until we again found the Sparrows in Gurais. It was here also that the last Paradise Flycatchers were noted, a single pair amongst some almond trees and one at Mirpur but a few miles further on.

At the entrance to the Tithwal Gorge I had an amusing hour or so trying to collect specimens of Alpine Swifts. They had their quarters in some crevices in a perpendicular cliff about forty yards above the path. A screaming band would literally hurtle past the crevices, one or two birds swinging upwards and rapidly creeping into a crack whence issued further chitterings. I regret to say that I expended ten cartridges without the least effect. The bands arrived over a little spur with such incredible speed that an aimed shot was an impossibility. I tried standing with the gun to my shoulder aiming at a favourite crack until I could stand the strain no longer when of course with a swish like a passing shell half a dozen birds would rush by. Browning being inffective I attempted to get birds as they crawled into one of the narrow cracks. Twice I succeeded in peppering one, but each time it just seemed to shake itself and crawl in the faster. The range was too great for No. 10 shot and dust from the .410 bore. I returned in the evening with 6's but alas they had already retired for the night.

The next stage was a long one, approximately 17 miles to Salkalla. We arrived tired and thereby chose just about the worst camping ground we could have done. Next day we wondered how on earth we could have hit upon such a sandy spot when within two hundred yards was a comparatively grassy patch under a chenar quite close to the spring whence we drew our water.

Incidentally in three weeks we used the tents for as many days, so at Keran sent them back to Srinagar over the 10,000 ft. Pass which leads to Tregam and Sopor. Not only are there frequent forest rest-houses at convenient intervals all through except at Kel and at Taobat, but to find camping grounds anywhere along the whole length of the valley until one is nearly in Gurais is almost an impossibility. Where a flat space large enough to pitch a tent does occur, it is either incredibly dirty, having been well fouled by successive pack-mule caravans, or else it has been turned into a narrow field and consequently is either bearing a crop or in process of being ploughed up. I advise travellers to obtain permission to use the forest rest-houses—most of them have two rooms with just sufficient furniture—take one small tent for use in case of necessity and their own camp furniture. The use of each room is only eight annas a day, so not only does one save coolies, who are not always easy to collect in the lower reaches, but one saves considerable expense into the bargain.

A further change was coming over the birds. The zwang-zwang-zwang of Stewart's Bunting faded out somewhere in the neighbourhood of Salkalla and the Meadow Bunting took its place. Blue Magpies became common, Black Bulbuls excessively so, and Turtle Doves appeared. Scaly-bellied Green Woodpeckers were by no means uncommon. In fact one had reached a new zone of bird life. Salkalla is only 4,500 ft. above sea level but its bird



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Entrance to the Tithwal Gorge. Alpine Swifts occupied crevices in the cliff face near the small bridge on the right.

population appeared to correspond with about the 6,000 ft. level of such valleys as the Sind and Lidar off the main vale of Kashmir.

At Keran we stayed a week. We were overtaking the snow level which was then only three marches ahead. Keran itself had experienced a late fall on April 14 but it also appeared a good place for birds. The woods were thicker—deodar, long-leafed pine, horse chestnut and other trees on both sides of the river, and the Ilex growth scantier. The latter, which had been much in evidence from below Salkalla soon after disappeared altogether. There are also two big villages and a considerable crop area as a stream flows into the main river on each side. Chukar abounded on one slope. The Blue Magpie parties were breaking up into pairs: Pied Woodpeckers appeared, and altogether we had an interesting time.

Alas! few birds except Whistling Thrushes, Plumbeous Redstarts, and Brown Dippers, whose photographs I already have in plenty, had really got down to nesting, so bird photography was still at a discount, but the list of species noted soon swelled to the neighbourhood of ninety. The first Crested Black Tit and the first Simla Black Tit were noted, while Short-billed Minivets in large bands were most numerous. Pipits I still did not meet. In fact I had only seen one in the neighbourhood of Dhanni when I was without my gun.

The stretch from Keran to Sharda we did in two instead of the usual three marches, but the 14 miles to Reshna is better done in two stages, halting at Doarian where there is another F.R.H. Doarian to Reshna is decidedly hard going, the path having to ascend through the forest some hundreds of feet to surmount the towering cliffs of a narrow rocky gorge.

At Sharda I heard Thrushes singing a few hundred feet above the rest-house. They turned out to be Grey-headed Thrushes and were mating. I also saw here a Blue-headed Rock-Thrush for the first time and a Missel Thrush. The forest was thoroughly suitable for the Grey-headed Thrushes. Many chestnut trees, just unfolding their leaves, were growing amongst towering forest giants of deodars and silver and spruce firs, numbers of whose rotting trunks were strewn over the steep hillsides collecting drifts of melting snow against their slippery decaying sides. A thin, as yet leafless, parrottia scrub formed the undergrowth.

By the time we reached Kel on May 11, a further change had come about. The deodars had almost disappeared and the firs predominated, though long-leafed pines were again common. Unfortunately these close-growing fir forests which now persisted for the rest of our trek to Gurais contained little undergrowth, so a great many birds which prefer woods of a more mixed character were absent or rare. Wide snow drifts across every nullah and stream slowed up one's rate of march. On the south bank snow was still lying in the forest, and here I heard and saw the first and last Yellow-billed Choughs. 6,500 ft. is surely a very low altitude for these birds even in early May.

We had thoroughly bad luck at Kel, the one and only stage where no forest hut of any kind exists. Shortly after our arrival the temporary bridge over the Barai nullah, within three hundred yards of which we had pitched a tent on the roof of a deserted hut, was swept away, and we were let in for an enforced stay of three days. I regret now I did not climb the hill immediately behind our camp as I believe a good view of Nanga Parbat, but thirty-five miles away, is to be obtained from its summit.

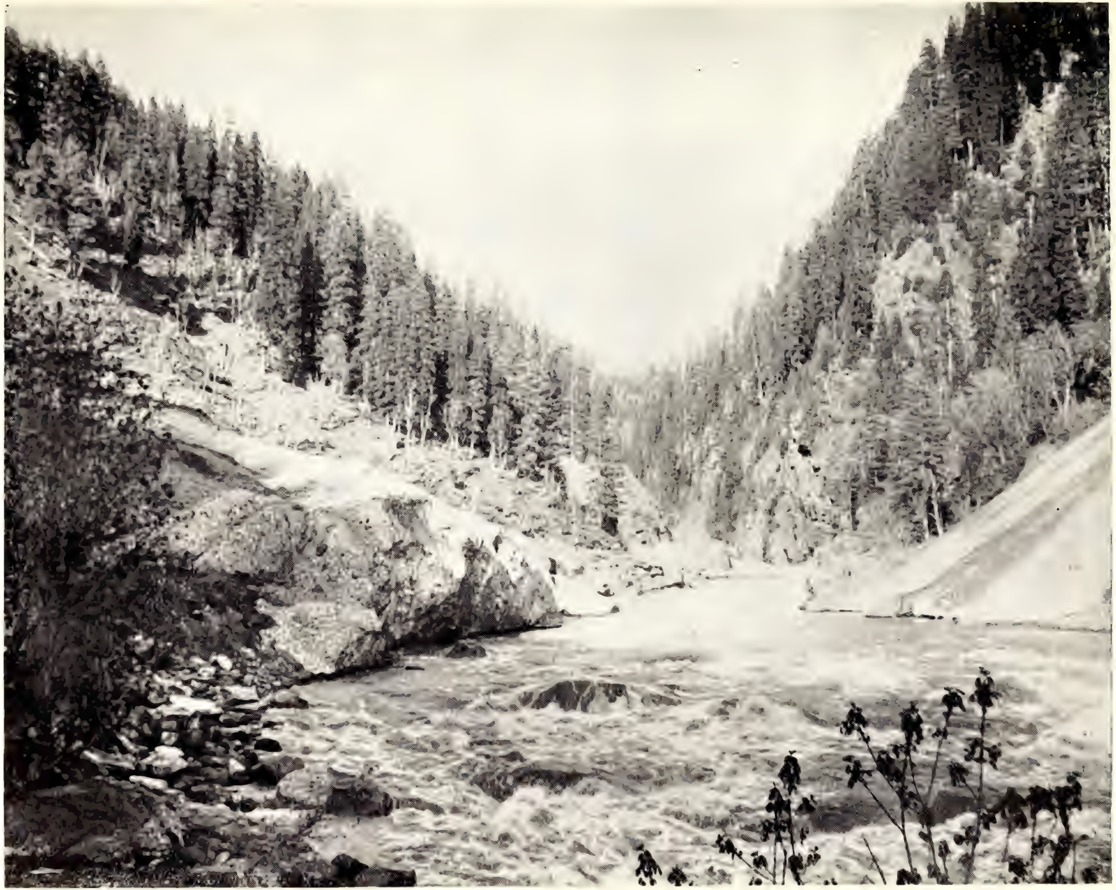
Fortunately for us the lambardar of Kel was an enterprising soul and nobly turned out a stout band of villagers who, with the help of men from a small hamlet on the other side, threw a primitive cantilever pine-log bridge across a narrows. Unfortunately it entailed a detour of two miles up the nullah and an appalling scramble over snow shoots and the steepest of slopes before we were back on the path. Nevertheless we shall remember the lambardar of Kel with real gratitude.

Our troubles as regards the path were now practically over. We still had a few tricky places to get across—one where a snow bridge had collapsed and we had to descend the stream between deep snow walls splashed by the iciest of waterfalls and crawl under the overhanging lip along the river edge, a by no means pleasant experience, and I for one heaved a sigh of relief when the last coolie was through, as a block of snow the size of a house looked ready to crack off at any moment.

We spent two full days at Janwai and then made for Taobat. Between Kel and Janwai the forest on both sides of the river was amazingly thick, but now, six or seven miles short of Taobat, the valley at last really did open out. The slopes still went up straight from the river but at a gentler angle. Villages and cultivation were more in evidence: one could actually see hilltops and margs. The fall of the river was less and the din of churned up seething mud-stained water diminished. It frequently widened out enclosing a few islands and at last the querulous twitterings of Sandpipers were frequently heard. I had seen but one or two of these birds all the way up and had come to the erroneous conclusion that the Kishenganga was not to be counted as one of their best loved routes from the plains. It was now, and only now, that we fully realised the extraordinary nature of the valley we had traversed. For 120 miles we had walked through fearsome gorges until we expected nothing else. At last we were in country more like that to be found in the better known valleys of Kashmir.

After a somewhat draughty and chilly night at Taobat as our shelter consisted of a large one-roomed hut with wooden barred openings on opposite sides for windows, a 'kuth' store, we went on to Gurais.

The river here takes a wide double bend between heights of 13,000 ft. or so and passing along this bend we could not help feeling that we were in a milder more hospitable clime. This seemed to be definitely true as I began to note again birds which we had left behind at considerably lower levels. At Bagtor Rufous-backed Shrikes re-appeared and at Gurais itself House-Sparrows outnumbered Cinnamon Tree-Sparrows by twenty to one, while Sandpipers became increasingly numerous.



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View near Kel. From here the fir forest became increasingly thick.

But we were not impressed with Gurais. True the snow had hardly melted: flowers were practically non-existent, and the weather broke. Perhaps we had been expecting too much, but we had undoubtedly passed through much finer scenery. After a day's rest we therefore retraced our steps to the Bagtor F.R.H. two miles below Kunzalwan, charmingly situated on the edge of the forest on a sloping green marg still soaked with but recently melted snow, where bright blue gentians already starred the earth, and where irises were soon to cover the sward in wide patches. There we spent a thoroughly pleasant ten days from May 21 to May 30.

Migrants were still arriving. One day I suddenly realised that Sooty Flycatchers were about, hawking flies from the highest perches to which they would return again and again, while three days before we left I thought I heard a Blue Chat, soon confirmed as next day two were calling and thereafter they were everywhere.

On May 30 we left on the final stage to cross the Razdhainangan Pass and descend into the vale of Kashmir. There is little more to add. As we left Koragbal I heard the unmistakable five-noted call of the Large-billed Willow-Warbler and went on hearing it until we left the vicinity of the stream near Gorai. The pass was very trying. In spite of getting up at 4 a.m. in a sharp frost the snow was very soft and through it we had perforce to plod and slip and sink for nearly six miles before leaving it behind for good at the top of the Tragbal forest. A biting wind was blowing in our faces as we neared the crest and our toes were like blocks of ice but it was a perfect day and the views in all directions more perfect still.

As we trudged down the Tragbal forest I received ample confirmation of the rigour of the Kishenganga's climate compared with that of the vale of Kashmir and its immediate side valleys. Birds were much more numerous, the Meadow Buntings and many other birds obviously breeding freely, and below Tragbal the wild roses were glorious with many Hume's Lesser Whitethroats breeding amongst them. Nevertheless I soon ascertained that conditions really were abnormal everywhere, as after arrival in Srinagar my efforts to get at least a few photos of the water birds of the Dal Lake were quite abortive as the water was very deep and the birds I wanted only just commencing to build. As the Kishenganga from its very topography and climate is bound to be backward compared with the vale of Kashmir, it is not surprising therefore that I had found so few nests.

NOTES.

The following condensed notes may be of use to others taking the same route:—

(1) Kashmir always experiences rainy weather in the first half of April. In a valley of the character of the Kishenganga, this is bound to result in frequent landslides rendering the path unfit for anything except lightly laden coolies.

(2) Repairs to the path are only considered after the better weather has set in and the snow melted in the upper reaches, and take considerable time to effect.

(3) From approximately Sharda the danger from avalanches and landslips is not over even in normal times until well on into May. Thus

(4) one cannot count on being able to use animal transport until the beginning of June.

(5) The forests of the valley are divided into three divisions:

(*a*) Muzzaffarabad Division,
(*b*) Keran Division, and
(*c*) Sindh Division.

In order to use the forest rest-houses permission must be obtained from the respective Divisional Forest Officers whose offices are at Muzzaffarabad, Keran, and Bandipur.

(6) These F.R.H.'s have furniture, including bathroom utensils, with the exception of Janwai F.R.H. which had nothing.

(7) There are no F.R.H.s at Kel and Taobat, but at the latter place is a large one-roomed shed which may be used. There is of course no cook-house or servants' quarter along with it. The Bagtor F.R.H. is 5½ miles further on but this makes it a twenty-mile march from Janwai—not impossible of course provided the path has been repaired and one can use ponies as the going is good except over one or two short stretches.

(7) Tentage may be used in place of going to the rest-houses but places to pitch them are difficult to find until after Janwai, the only available ground often being in the F.R.H. compounds.

(8) Milk, eggs, chickens, and sheep are obtainable. Butter is not good and the sheep are miserably thin as the grass is of scant growth until June. Vegetables are quite unprocurable with the exception of dandelion leaves which make quite presentable spinach.

(9) The time of year to undertake the trip is rather difficult to advise upon, as the lower end of the valley warms up very quickly. Even on April 24 we found Tithwal decidedly hot. But if one starts too early one overtakes the melting snows and finds the path frequently blocked or damaged. Personally I would advise starting in the first week of May and moving up more slowly than we did.

(10) Should one wish to strike into the valley instead of starting from Domel, there are three good passes leading from Kamraj or the Lolab to Tithwal, Keran, and Dudhnial. These are not likley to be practicable for ponies until well on into May or even early June.

SYSTEMATIC LIST.

(1) **Corvus macrorhynchus intermedius.**—Jungle Crows were common all along the line of march and were noted to be building in April; namely at Dhanni on April 22, near Tithwal carrying lining material on April 23, and at Salkalla on April 27.

(2) **Corvus splendens.**—House-Crows were totally absent from the valley. Villages like Tithwal and Keran might have been expected to harbour colonies of this crow but the last I saw were near Abbottabad in Hazara.

(3) **Corvus monedula.**—This bird also has really no place here as it was never met with. A pair were however seen not far from Garhi Habibullah in Hazara shortly before crossing over into the Kishenganga Valley.

(4) **Urocissa flavirostris cucullata.**—These beautiful birds were very commonly met with in the lower parts of the valley, the last, a party of three, being seen a couple of miles beyond Dudhnial at an elevation of approximately 6,000 ft. on May 8. More often than not they were in small flocks but single pairs were not infrequently met with. For instance, we had two pairs near us at Keran occupying territory on either side of the Rest-House. Stuart Baker, *F.B.I.*, 2nd Edition, vol. i, remarks that they haunt principally evergreen forests and heavy jungle. I would rather put it that they haunt the outskirts of evergreen forest and heavy jungle, seldom if ever being found far within the latter, unless well provided with glades dotted with trees and tall bushes. They often visit cultivation where it lies close to forest, and I have not infrequently seen them hopping about ploughed fields in a most ungainly manner.

(5) **Garrulus lanceolatus.**—On April 26 I procured a female which flew across a small patch of cultivation into some light mixed forest by the river side at Salkalla. The ovary was slightly developed, having a granular appearance. A pair was seen in similar country three miles from Salkalla on April 28 during the march to Keran.

(6) **Nucifraga multipunctata.**—A single bird was seen at Keran on April 30 on the edge of the forest by the F.R.H.

(7) **Pyrrhocorax graculus.**—A party consisting of some thirty birds was seen on May 12 at Kel. Taking advantage of the air currents they circled rapidly up a rather bare steep nullah behind our camp and were soon lost to view. None was seen elsewhere, not even during our crossing of the Razdhainangan Pass.

(8) **Parus major cashmirensis.**—Very common as far as Sharda after which they became progressively scarcer until the last one was seen and shot on May 17 five miles beyond Janwai at an elevation of 7,200 ft. At Keran at the beginning of May they appeared mostly to be concerned with searching for nesting sites, but the specimen procured near Janwai proved to be a breeding male.

(9) **Parus monticolus monticolus.**—A single pair was remarked at Keran on May 3 in some mixed forest about 300 ft. above the F.R.H. They were not uncommon at Sharda.

(10) **Lophophanes melanolophus.**—First noted in the Keran Forest at 5,300 ft. on May 1. Thereafter it was met with at each halt to Bagtor. The next species, however, seemed to be the common Black Tit of the Kishenganga.

(11) **Lophophanes rufonuchalis rufonuchalis.**—Also first seen at Keran, on May 5, where it was undoubtedly more numerous than *melanolophus*. It was in fact the commonest Tit seen from there right up to Gurais, and most of the Black Tits on which I levelled my glasses turned out to be of this species. A pair was watched inspecting holes in the ground for a nesting site in the forest on the edge of the path near Kunzalwan on May 18. I am quite convinced that numbers of 'Black Tits' nests taken from holes in the ground in the forests of the Kashmir valleys and recorded as *melanolophus* are in reality those of *rufonuchalis* and that the bird is much commoner throughout Kashmir than it is recorded to be. I am sure that I have unfortunately been guilty of the error myself. The two birds are not very easy to differentiate except at the closest range with glasses.

(12) **Sitta leucopsis.**—Marching back to Bagtor from Badwan on May 20, I heard a very harsh call issuing from the summit of a tall spruce fir. Two birds of the size and shape of Nuthatches flew out and across the path into the thick forest on our left. Judging from their notes I consider they must have been of this species. They were the only Nuthatches seen throughout the valley.

(13) **Trochalopteron lineatum lineatum.**—Evidently a common bird throughout the valley wherever ground suited to its requirements occurs. Although an arrant skulker it does not mind leaving cover if undisturbed. A pair haunted the compound of the F.R.H. at Tithwal although it could boast of but three bushes capable of affording any protection from view. Near Sharda I saw one out in the middle of a ploughed field, while at Bagtor one was actually noted sitting on the roof of a house. It only shuffled away when I approached and levelled the glasses in its direction. They possess a very plaintive unmistakable three-noted danger call of 'twee-twee-twee'. Two males shot at Pateka on April 20, which I had taken for a paired couple, had the testes enlarged to the size of peas but a search for a nest only produced a last year's one.

(14) **Microscelis psaroides psaroides.**—From Muzzaffarabad, where I saw a pair in the trees of a cemetery just before getting into the gorge, to Keran (5,000 ft.) these birds became increasingly common. I saw a pair at Reshna (5,900 ft.), 13 miles further on, but none after that, although I thought I heard their harsh notes once at Sharda but may have been mistaken.

(15) **Molpastes leucogenys leucogenys.**—Common as far as Tithwal. I noted one or two at Salkalla (4,500 ft.) but none beyond.

(16) **Certhia himalayana limes.**—The first Tree Creeper was noted at Pateka on April 24. This bird, a female, was not in breeding trim. Others were seen at Keran, Janwai, Bagtor, and Badwan. At Bagtor they were very numerous. A male shot at Janwai on May 16 had the testes greatly enlarged. Hodgson's Tree-Creeper was not noted.

(17) **Troglodytes troglodytes neglectus.**—I did not come across this cheerful little songster until I had climbed to about the 8,500 ft. level into a rocky rather gloomy patch of forest in the Gishat nullah at Bagtor on May 24. I heard them again after passing Gorai on the way up to the Razdhainangan.

(18) **Cinclus pallasii tenuirostris.**—Exceedingly common along the river, and its side streams, over its whole length. Young birds strong on the wing were seen from Pateka in April to Badwan and Bagtor at the end of May. One bird was observed sitting, presumably on eggs, in an inaccessible nest at Tithwal on April 24. Although undoubtedly an exceedingly early breeder, the nesting of this bird is very prolonged, to a certain extent depending on elevation. I have seen young ones in the nest at between eight and nine thousand feet in the Lidar Valley as late as August.

(19) **Tarsiger brnnnea.**—This bird only put in its first appearance on May 28 when I recorded that I thought I heard its notes once in the Gishat nullah at Bagtor. I had ample confirmation next day when I heard two at once on either side of the F.R.H. Thereafter they became increasingly numerous.

(20) **Saxicola caprata bicolor.**—Not uncommon at Domel and seen again at Pateka between April 18 and 21.

(21) **Saxicola torquata indica.**—Common throughout the valley. Signs of breeding were noted from the end of the first week in May.

(22) **Rhodophila ferrea ferrea.**— Common at both Domel and Pateka. None seen further up the valley.

(23) **Œnanthe picata.**—On April 18 I saw one of these birds on a stoney patch just opposite the old fort at Muzzafarabad and another one a little further on, likewise amongst stones and boulders.

(24) **Enicurus maculatus maculatus.**—Noted at Keran and Sharda on May 1 and 10 respectively. From their behaviour I am sure the Keran pair had a nest but I failed to locate it. This bird is probably much commoner in the Kishenganga than it appeared to be but I visited few streams suitable to its habits, except at Bagtor, where, however, I never came across it.

(25) **Microcichla scouleri scouleri.**—Generally connected with mountain torrents in the steepest of nullahs well provided with waterfalls where this little bird can play about in the spray. At the Gehl nullah between Tithwal and Salkalla

on April 25, one was seen right underneath a voluminous fall and another in a typical situation at Janwai on May 14, but two miles beyond Dudhnial, where the river for once flows serenely between wide banks, I was surprised to see a Little Forktail pottering around a boulder some ten yards out from the near bank. We did not pass a side stream for another quarter of a mile. This was choked with snow and had very little water in it.

(26) **Phoenicurus frontalis.**—One was noted in Gurais on May 19 feeding in a patch of viburnum near Wampur village.

(27) **Chaimarrornis leucocephala.**—Common everywhere along the main river and also to be seen on the larger streams. In my opinion the majority of these Redstarts breed late, from the end of June, and move up very leisurely from the lower winter levels to their breeding grounds in the neighbourhood of eight or nine thousand feet upwards. A male, shot at Bagtor on May 23, had the testes greatly enlarged and appeared to be breeding.

(28) **Rhyacornis fuliginosa fuliginosa.**—As common along the whole length of the Kishenganga as along the other Kashmir rivers. I noted no signs of nest building until we were at Keran at the end of April. From the beginning of May many pairs had commenced nidification, and at Bagtor on May 27, the only time I really searched for them, I found nests both being built and containing fresh eggs.

(29) **Calliope pectoralis pectoralis.**—The first one seen was feeding in some viburnum bushes twenty yards from the Bagtor F.R.H. on May 29. It was a male with organs developing and may have been driven down from higher levels by the stormy weather we had experienced on that and the two previous days. The next one I saw was sitting unconcernedly on a stone by the broken bridge near the remains of the Gorai dak bungalow.

(30) **Ianthia cyanura pallidiora.**—First noticed near Badwan on May 20, but on our return to Bagtor I found them very common there, often coming out into the viburnum shrubs running along the edge of the forest. On May 21 I shot what I thought was a female, only to find it was a male in immature plumage with testes well enlarged. A second one in full plumage shot the next day appeared to be hardly contemplating breeding.

(31) **Copsychus saularis saularis.**—As usual there was a pair in the Domel dak bungalow compound, and I saw one by the roadside as we passed through Muzzaffarabad.

(32) **Turdus boulboul.**—A dark unicoloured Thrush with an orange bill, which I took to be a female of this species, was seen quietly feeding on the ground in a small bagh three miles from Pateka on April 22.

(33) **Turdus rubrocanus rubrocanus.**—Only met with at Sharda, May 8 to 10, although a fine song heard near Gorai at 9,000 ft. on our way to the Razdhainangan Pass on May 31 was attributed to this species, as well as a number of old nests on the edge of the fir forest at Bagtor. At Sharda it was common above the rest-house and a male shot there had its testes greatly enlarged. They appeared to be mating as no less than five were seen at once chasing one another about the wood to an accompaniment of much cackling. As already stated the forest here was most suitable for them. After Sharda it was composed mostly of silver fir and spruce and was very thick and lacking in undergrowth.

(34) **Turdus atrogularis.**—A party of these Thrushes flew into the tall trees in the Domel dak bungalow compound just as we were preparing to leave on April 18.

(35) **Turdus unicolor.**— Only noted at Keran where I shot a male with greatly enlarged testes out of a pair which flew over the F.R.H. on May 3. Another bird was seen on the Nilam plateau near Keran two days later.

(36) **Arceuthornis viscivorus bonapartei.**—One seen at Sharda on May 9 and another at Janwai on May 16.

(37) **Monticola cinclorhyncha.**— First recorded at Sharda where I saw a male on May 10 when watching the Grey-headed Thrushes. I heard the song on

several occasions during the remaining marches to Gurais and found them to be fairly common at Bagtor. I spent two whole days towards the latter end of May looking for their nests but without success. The pleasant though rather monotonous song of the male, so often rendered from the very pinnacle of a pine or fir tree, renders this bird easily traceable.

(38) **Myophonus caeruleus temminckii.**—Common everywhere and numbers had nests even from the date of our arrival in Domel, although I think few birds were then at the stage of incubating eggs but merely building. On May 11 between Sharda and Kel I observed three nests on ledges of the steep rock face of the further bank of the river within less than fifty yards of one another. On two of them birds were sitting. The other nest was visited twice. At Janwai there was a nest with three fresh eggs in it on a rafter of the F.R.H. verandah, while at Taobat one had actually built on a beam inside the shed in which we spent the night.

(39) **Prunella strophiata jerdoni.**—A male was singing on a branch just over our heads shortly after we got into the forest at Gorai (9,000 ft.) on May 31. It was obviously breeding, its testes being very greatly enlarged.

(40) **Hemichelidon sibirica gulmergi.**—I only became aware of the presence of these birds after we had been at Bagtor some days, that is on May 25, when I came on quite a party near the mouth of the Shalput nullah. One pair appeared to be building near the end of a branch high up in a fir tree. They have a very characteristic habit of hawking insects from a high perch to which they often return. After the date in question I saw many even around the F.R.H. They were very numerous at Koraghal in some birch trees on the evening of May 30.

(41) **Muscicapula superciliaris superciliaris.**—First noted at Salkalla. They were common at Keran where I watched a pair on April 30 fussing around a crack in an old split trunk. Both birds entered the cavity repeatedly although I was but four feet away. They eventually rejected it as a possible nesting site. I saw none beyond Reshna.

(42) **Eumyias thalassima thalassima.**—One pair observed by a small stream on a bush-covered hillside at Pateka on April 20.

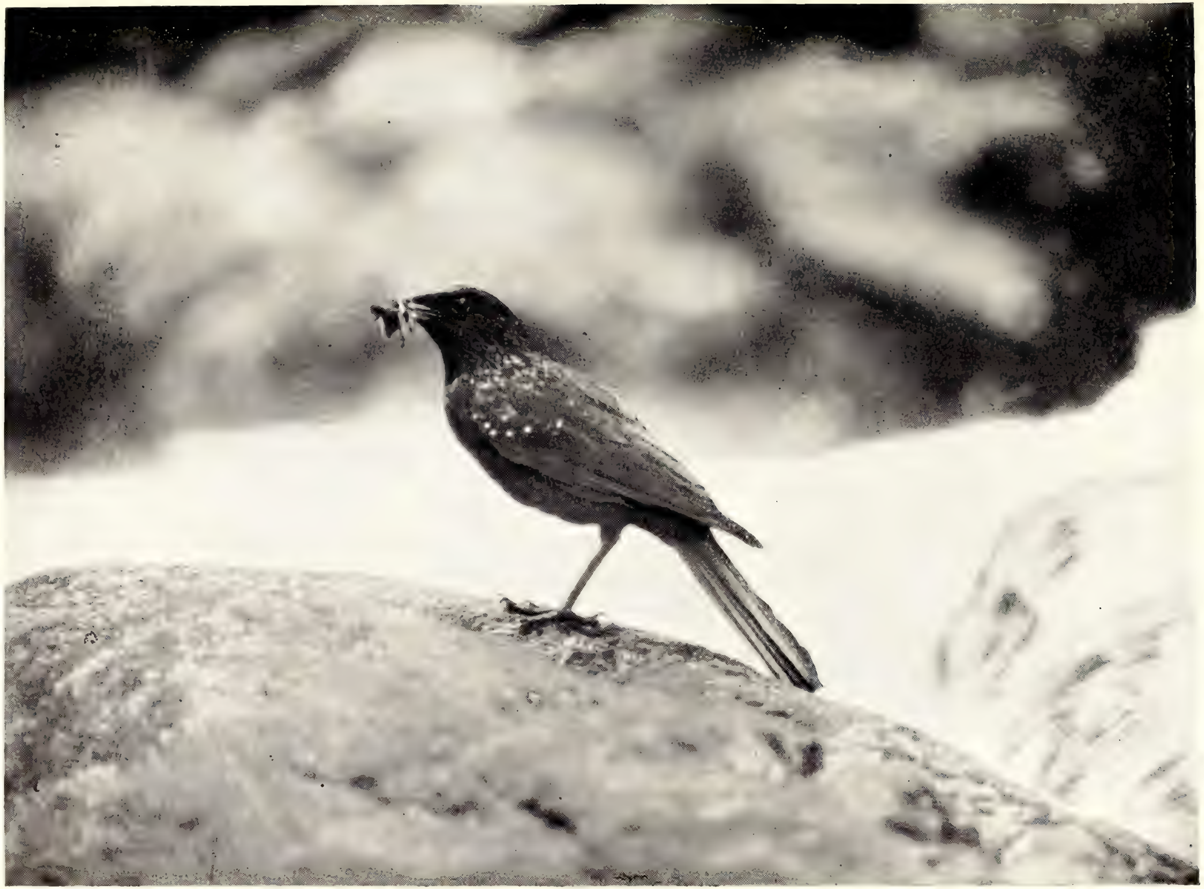
(43) **Alseonax ruficaudus.**—I first met with this rather unobtrusive Flycatcher at Keran. It may occur lower down the valley but until I had shot one I was not conversant with its notes and may have missed it. They were exceedingly common and breeding around Bagtor. Incidentally I found no trace of the occurrence of latirostris.

(44) **Culicicapa ceylonensis pallidior.**—The trees of the Dak bungalow compound were full of these flycatchers all through the day of our arrival at Domel, April 16. The following day they had passed on; apparently up the Jhelum valley as only at Keran on April 29 did I hear the unmistakable notes of a single bird.

(45) **Niltava sundara whistleri.**—Seen in the Domel Dak bungalow compound on both April 17 and 18, possibly the same bird both times.

(46) **Tchitrea paradisi leucogaster.**—Numbers of these beautiful birds passed through Domel the day after our arrival there, April 17. I don't think I have ever seen so many as I did at Pateka during our three days' halt at that place from April 19 to 21. Nevertheless I only saw one pair at Tithwal (April 24) in some almond trees and a single bird five miles further up at Mirpur, elevation 3,700 ft., on April 25. I quite expected to see them at Keran but none had appeared when we left on May 7. In fact this striking bird seemed to be unknown to villagers I questioned around Keran. Between Dusut and Sharda, 6,130 ft., there are many little orchards of cherry and apple trees as the valley is somewhat wider but this is perhaps a little too high for them to penetrate to.

(47) **Lanius vittatus.**—A single bird attributable to this species was seen at the edge of a small copse between Tithwal and Salkalla at about 4,000 ft. on April 25.



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Myophonus coeruleus temminckii on the way to its nest.

(48) **Lanius schach erythronotus.**— Common at Pateka. We had a pair in the F.R.H. compound. I then saw them at Keran on the little plateau on which Nilam village stands, the elevation being about 5,400 ft., and shot a breeding male there on May 5. After that none was seen until we were passing through Bagtor where the river makes its abrupt turn into the wider milder Gurais valley. They were not uncommon in Gurais.

(49) **Pericrocotus brevirostris brevirostris.**—Noted immediately on our arrival in Keran where they were commonly seen in flocks of considerable size feeding through the forest often descending into the parrottia scrub. A male shot there on April 29 had the organs only slightly developed. They were common enough right up to Gurais, but from Keran onwards the flocks appeared to be breaking up into pairs.

(50) **Dicrurus macrocercus albirictus.**— Became increasingly common as we approached Keran. At that place a pair near the F.R.H. were most aggressive and may have already been breeding. I have no records of any seen after Keran.

(51) **Sylvia althæa.**— On May 1, I shot the male out of a pair seen in the viburnum and rose bushes on the edge of the Nilam plateau near Keran. Its testes were enlarging. It appeared very suitable ground for them and they may well breed there. I saw them nowhere else.

(52) **Phylloscopus affinis.**—A small party of these diminutive but hardy warblers was noted on passage at Pateka on April 19.

(53) **Acanthopneuste magnirostris.**— The characteristic five-noted call of this Willow-Warbler was not heard until we were leaving Koragbal in the small hours of the morning of May 31. I heard them frequently as far as Gorai where we left the vicinity of the stream. A few days before leaving Bagtor I had noticed that a very plain-coloured Willow-Warbler had appeared in small numbers in the Shalput nullah. This bird, which was then silent, fed largely in low bushes and close to the ground on weedy grass-covered banks along the stream. A specimen, a male with testes enlarging, shot on May 25 in this nullah, turns out to be *magnirostris*.

(54) **Acanthopneuste occipitalis occipitalis.**— Noted commonly throughout the valley. In April in the lower reaches they were probably only on passage. But at Keran in early May I began to hear their plaintive danger call.

The commonest Willow-Warbler of all, especially in the fir forest zone, was a small yellow-rumped bird, almost certainly *Phylloscopus proregulus*. So many Willow-Warblers were only passing through that I shot none of this species intending only to procure specimens actually nesting. I rather suspect that this bird is a late breeder and none seemed to have commenced nidification when we left the valley.

(55) **Homochlamys pallidus pallidus.**—This little bird of the intriguing voice was heard at Pateka, Salkalla, and Keran, in all of which places it appeared to be fairly prevalent. Keran being but five thousand feet above sea level I expected to meet with it much further up the valley, but, although the hillsides on the north bank of the river at Sharda looked ideal for it, I never heard it there. Is its range in the Kishenganga very restricted or did we pass it at Keran moving up the valley even more slowly than we were doing?

(56) **Suya criniger criniger.**— Common at Pateka; heard again near Dhanni, and one seen on a bushy hillside at Keran at about 5,400 ft. A male shot at Pateka on April 19 in the thick bushes just by the F.R.H. showed that breeding was about to commence. Incidentally it seemed to be a well known bird there and had the local name of *phitta*.

(57) **Regulus regulus himalayensis.**— The only one recorded was seen in the fir forest in the Shalput nullah near Bagtor at about 7,600 ft. on May 22. Unfortunately I blew it practically to pieces. Its testes were enormous and very pulpy but I could find no nest.

(58) **Oriolus oriolus kundoo.**— A single bird flew across the river four miles from Pateka during the march to Dhanni on April 22.

(59) **Acridotheres tristis tristis.**— Common enough at Domel but met with them nowhere in the valley except at Tithwal where there is an isolated colony. I presume they must have worked their way from Kamraj over the comparatively low passes at the head of the Kazinag nullah.

(60) **Perrisospiza icterioides icterioides.**— On April 29 a flock flew past the F.R.H. at Keran and I heard their pleasant notes in the neighbouring forest for some time. I next met with this finch at Bagtor on May 24 and subsequent days, when I often heard and saw a small flock feeding through the forest above the rest-house. I also heard them in the Gishat nullah. On May 30 I saw some in the trees above the Koragbal Dak Bungalow shortly after our arrival there, and on the following day others were noted in the Gorai forest at about 9,000 ft.

(61) **Callacanthis burtoni.**— A single pair flew off the path between Badwan and Kunzalwan (7,800 ft.) on May 20 and as usual sat still and unperturbed on a rock quite close to us at the edge of the forest to let us go by before resuming feeding. I shot the female in the hopes of obtaining an oviduct egg but the ovary only contained yolks about the size of pin-heads.

(62) **Passer domesticus parkini.**— Only met with at Tithwal and in Gurais. Nowhere else in the valley. In Gurais they were very common, outnumbering the Cinnamon Tree Sparrows by about twenty to one.

(63) **Passer rutilans cinnamomeus.**—First noted three miles beyond Dhanni on April 23. This would be at an elevation of approximately 3,250 ft. They were common thence right up the valley though at Tithwal the birds in and around the village were *Passer domesticus*. Again in Gurais they seemed comparatively scarce where *domesticus* was once again very much in evidence.

(64) **Emberiza stewarti.**—Exceedingly common as far as Tithwal. Somewhere in the neighbourhood of Salkalla (4,500 ft.) they gave place to the Meadow Bunting, the latter being alone noted at Keran. A male shot out of a party at Pateka on April 19 had the testes only very slightly enlarged.

(65) **Emberiza cia stracheyi.**— Meadow Buntings were first definitely identified at Keran whence they were common all along the valley. The organs of a male and of a female procured on May 1 at Keran showed only slight development; those of a male shot at Janwai on May 16 were practically normal, but those of another male obtained at Bagtor on May 21 were considerably enlarged. Nest-building was first observed at Bagtor on May 24. As usual the ranges of *stewarti* and *cia* did not appear to overlap. Coming down the Tragbal forest it was also observed that the White-capped Buntings commenced where the Meadow Buntings ceased.

(66) **Melophus melanicterus.**— A male was noted as we crossed a small cultivated spur four miles from Pateka on April 22. On our way down from Srinagar on June 12, I noticed they were common from Garhi downwards.

(67) **Delichon cashmeriensis.**— I was particularly on the look-out for Martins, but in spite of passing excellent country between Kel and Janwai none was seen until May 25 and the following day when a party appeared out of the Shalput nullah at Bagtor. They were feeding over the marg high up with a party of Swifts, but after a time a band came fairly close and I brought one down with a lucky shot. Shortly afterwards the whole party returned whence they had come. From the map the only likely nesting place seemed to be near the mouth of the nullah but through the glasses I could make out no suitable cliffs or rocks.

(68) **Hirundo rustica rustica.**—Although seen at Domel, and I imagine large numbers must pass up the Jhelum, the Swallow was not seen and is apparently unknown in the valley. Many of the houses are constructed as in the vale of Kashmir but enquiries at Pateka elicited the fact that no Swallows built in the houses although the nesting of the Striated Swallow, which they called *phairni*, seemed to be well known to everyone.

(69) **Hirundo daurica scullii.**— The moment I went out of the hut the morning after our arrival at Pateka (April 19) I noted a pair of Striated Swallows flying round the compound. The zaildar, who called the bird *phairni*, said

they would have eggs in about twenty days' time. On the strength of this, as I hoped to procure specimens at the nest, I only shot one, a male with testes the size of lentils. The following day half a dozen birds were about and often rested on the rafters of the verandah. I examined likely nesting places in the adjacent nullahs but could find no signs. In fact the only time I came on a nest was on the remains of an old one halfway between Dhanni and Tithwal, elevation approximately 3,000 ft. At the Dhanni rest-house the eaves were also being used by these birds, and as far as the Tithwal gorge I noted them at times as we marched along. It was most disappointing therefore to find that they no longer occurred at Tithwal. 3,200 ft. seemed to be their limit.

On the journey down from Srinagar on June 12 I first noted one of these birds at the 37th mile from Kohalla. The elevation marked on the milestone was 2,860 ft. I saw them all the way to Kohalla, particularly about Domel, and even after we had left the Jhelum and climbed a thousand feet or so towards Murree I noticed odd birds. Two nests were also observed, one crumbling, the other new looking, on rocks overhanging the road near the 29th milestone.

(70) **Motacilla alboides.**—Pied Wagtails were very common in the lower reaches of the valley in April, both grey and black backed birds being noted in numbers feeding in ricefields and other wet patches. These birds were probably on passage. In May as we approached the upper reaches of the river I came to the conclusion that I was only observing Hodgson's Pied Wagtails which were then to be found in pairs at rather wide intervals. As I was particularly keen on collecting only those birds which I knew to be actually breeding, I collected no specimens as I found no nest, nor did I observe any birds even carrying building material.

(71) **Motacilla cinerea caspica.**—Grey Wagtails were very common throughout. Their vanguard is certainly early on to the breeding grounds at the lower elevations, and even in April intruders were very rapidly 'seen off' occupied territory. Nevertheless nesting activity was hardly noticed before the march from Janwai on May 17, during which I saw no fewer than three separate birds carrying building material.

(72) **Anthus roseatus.**—With the exception of a single bird seen in some cultivation on one of the first marches, which I failed to procure, I saw no Pipits until Kel was reached. Here was a stretch of very damp grazing ground on which Pipits abounded. Two obtained on May 13 proved to be females with the ovaries but slightly developed. Suitable grassy ground of the same description seven miles short of Taobat, at Taobat, Bagtor, and Gurais supported many of these same Pipits. The state of the organs of two males shot at Bagtor on May 27 showed that breeding was imminent. I also noted them at this place on much drier ground and even in newly-ploughed fields.

(73) **Alauda gulgula lhamorum.**—Neither heard nor seen until we first passed through Bagtor on May 18. They were common there and in Gurais. I found them feeding in small flocks on the grassy margs and amongst new plough, but a male shot on May 27 had the testes greatly enlarged, while two females had a few yolks measuring an eighth of an inch in diameter.

(74) **Zosterops palpebrosa occidentis.**—Flocks were noted from Domel to Keran wherever there were groves of leafy trees or bushes. The last were seen feeding in viburnum and other low bushes on the Nilam plateau (5,400 ft.) a mile or so beyond Keran on May 5.

(75) **Leptocoma asiatica.**—Evidently not uncommon at Domel as I saw two pairs in the course of an evening stroll on April 17. One pair was also seen twice at Pateka on April 18 and 19 in some bushes at the edge of cultivation about a mile from the F.R.H.

(76) **Picus squamatus squamatus.**—The loud call of this species first attracted my attention on our arrival at Salkalla on April 25, where I found it to be somewhat common in the open mixed forest and around clearings. It was common at Keran and I also noted it at Sharda, but it was not seen after leaving the latter place.

(77) **Dryobates himalayensis albescens.**—This Woodpecker was not recorded until we reached the 5,000-foot level at Keran where it was somewhat common. From Keran onwards it was noted at every halt to Gurais, but was scarce in the thick spruce and fir forests. I have always noticed that this Woodpecker has an undoubted predilection for chestnut trees and where these occur five out of every six nest holes will be bored in them. The thick fir forests from Kel upwards, containing but few trees of other species, consequently held but a limited number of Woodpeckers.

(78) **Dryobates brunnifrons.**–While searching for *Dryobates macei* at Pateka, with which I never met incidentally, on April 20 I shot a male of this species with testes developing, approximately $\frac{3}{16}$ inch in length, which was searching the trunks of an open wood of long-leafed pines in company with its mate. On arrival in Srinagar on June 2, I was surprised to see a pair of these Woodpeckers in the Chenar Bagh on one of the poles carrying the electric mains. They were most amazingly tame.

(79) **Iynx torquilla japonica.**—Shot one at Keran in mistake for another bird when it was feeding by the side of a small bush. Its stomach was filled with a large number of small red ants which accounts for its presence on the ground. It was a male with testes slightly enlarged. I observed this bird to be common at Kel, and also at Bagtor where I heard its call from three directions at the same time as we were passing through on May 18.

(80) **Cuculus canorus.**—Not common. It was first heard at Sharda between May 8 and 10, but only in the one locality. Near Kel on May 14 one flew across the path in front of us. At Bagtor up to the date of our departure I heard the call not infrequently from two directions. On crossing the Razdhainangan pass however and dropping into the Tragbal forest, it immediately became very common.

(81) **Cuculus optatus.**—Heard at Bagtor between May 20 and 29, but only occasionally. One appeared to have its territory in the forest around Izmarg between Bagtor and Kunzalwan, and another to the west of the forest rest-house.

(82) **Psittacula himalayana himalayana.**—Slaty-headed Paroquets were met with from the commencement of the trek and were last seen near Dudhnial at approximately 6,000 ft. on May 5. My wife aptly likened their screams when flying about in bands to the whistlings of marmots on a more subdued scale. A pair which seemed to have a nest behind the Keran bungalow, were also heard to produce some very pleasant soft notes, the screams being generally resorted to on the wing. A number of somewhat large elliptical holes with the axis horizontal, which I thought might have been made by this species, were noted at Keran and one or two other places about there, generally near the very summit of tall dead trunks standing in forest.

(83) **Ceryle lugubris guttulata.**—Nest holes of this fine bird were seen at the Ghori suspension bridge in the bank of the main river, where I was told the bird breeds regularly, near Mirpur, at Salkalla, and at Keran. At Salkalla on April 27 I surprised the birds during tunnelling operations. The hole they were boring was a yard from an abandoned hole three feet deep in the wall of a sandy recess on the inner side of the path where it runs close to the water's edge a mile below Salkalla. When first noted the previous day the new hole was under a foot deep, but in twenty hours another three and a half feet of sand had been excavated. Incidentally I saw no nest holes or birds on the side streams.

(84) **Alcedo atthis pallasii.**—I only saw a single bird and this in the Shalput nullah at Bagtor at 7,900 ft. on May 21.

(85) **Halcyon smyrnensis.**—Before the valley closed in a couple of miles from Muzzaffarabad I saw two or three of these birds, but the deep gorge thence to Ghori seems to have effectively barred their further progress up the valley.

(86) **Upupa epops epops.**—Not common. Only noted at the following places:—

May 5. Keran. One seen on the Nilam plateau.
May 8. Sharda. One by the suspension bridge.

May 19 and 20. Gurais. One seen near Wampur village and another haunted the P.W.D. Inspection bungalow at Badwan.

These were all light-coloured birds with much white in the crest so presumably *epops*.

(87) **Micropus melba.**—I have already related how I came on a colony of these Swifts at the mouth of the Tithwal gorge, and failed to collect any specimens. Narrow crevices in the rock face each seemed to be occupied by a number of birds. Some of these crevices were horizontal, others almost vertical. Noisy bands visited the crevices at intervals of roughly quarter of an hour, but a certain number of birds evidently seldom or never left them, as twittering noises emanated from within at frequent intervals the whole time I was watching, and on occasions single birds flew out. I climbed up a small steep rocky spur as far as I could but failed to get near enough to see anything. A party was also seen at Salkalla and a few birds were with the Martins seen at Bagtor.

(88) **Micropus apus pekinensis.**– Although only definitely recognised at Pateka, Keran, and Kel, this Swift is almost certainly quite common throughout the valley. Swifts imperfectly seen flying at high altitudes at practically every stage were most probably of this species.

(89) **Micropus affinis.**—A party of Swifts flying about below me in a deep gorge five miles beyond Dhanni was attributed to this species.

(90) **Hirundapus caudacutus nudipes.**—A band of these birds was seen on a number of occasions flying over Keran. After an exhibition of their amazing speed the flight of the Eastern Swifts appeared slow and laboured.

(91) **Caprimulgus macrourus albonotatus.**—Presumably this species. On both sides of the Pateka F.R.H. are deep nullahs; one a mass of tumbled rocks and debris, the other harbouring a small stream with open woods of long-leafed pines on its precipitous flanks. Between them is a grassy spur with pines scattered about it. At dusk each night, sometimes from the spur and always from the direction of the nullahs, I heard the rapid tuck-tuck-tuck of Nightjars. The notes were rapidly repeated in series of varying length at the rate of the ticking of a clock. Soon after the calling started, flighting also began. Going out the moment I first heard them in the hopes of collecting specimens I was surprised to note no less than three birds at once high up in the air hawking insects like Swallows. Standing well up the spur not one came over me low enough for a shot, and over the nullahs they must have been some hundreds of feet up though as it grew darker one commenced to swoop down into the pines further above me. These aerobatics appeared to last about half an hour. The calling also ceased as soon as it was dark. On my way up the spur one calling bird flew out of a pine where it had evidently been sitting about ten or fifteen feet up. After failing to get specimens at Pateka I hoped to meet with them further on but no more were either seen or heard.

[Mr. Hugh Whistler, who has very kindly read through the draft of this paper and examined the few skins collected during the trip, has drawn my attention to the descriptions of Nightjars' calls given in his Survey of the Eastern Ghats (*J.B.N.H.S.*, vol. xxxviii, No. 1). To transfer bird-calls to paper is an almost impossible task and I am not quite convinced that the Pateka Nightjar was not *albonotatus*, but must admit that his suggestion that it was more likely *indicus* may be right. At 9-30 p.m. on May 20 I recorded in my diary 'There is now a new sound (from some distance up the stony nullah)—a double note followed by a lower more subdued one—poo-poo-tuck poo-poo-tuck.']

(92) **Strix aluco biddulphi.**—This fine Owl was heard by the river at Badwan (Gurais) and a male was obtained at Bagtor on May 29 when it paid us a visit at dinner time. Osmaston's version of its call (*J.B.N.H.S.*, vol. xxxii, p. 140) does not seem to me quite correct. It struck me as being 'Hoo—interval—'Hoo'—shorter interval—'Hoo-ho-ho-hoo', the final 'hoo' being somewhat drawn out. In fact the notes are not unlike those of the Turtle-Dove. When picked up not quite dead, the bird I shot snapped its bill quite loudly a number of times. Its testes were not much enlarged, being about the size

of small peas. A bird was also disturbed by our dogs in thick fir forest above the Bagtor rest-house but it may have been the one I shot.

(93) **Ægypius monachus**.— One of these magnificient Vultures was come upon perched on a deodar branch on the edge of the Nilam plateau at Keran on May 1. On our nearer approach he sailed off in the direction of some towering cliffs a mile up the valley.

(94) **Gyps himalayensis**.—Common throughout the valley.

(95) **Pseudogyps bengalensis.**— One was seen cruising over the confluence of the Kishenganga and Jhelum rivers at Domel on April 17 in company with some Himalayan Griffons.

(96) **Neophron percnopterus percnopterus.**—Seen occasionally as far as Doarian (5,000 ft.). I once saw one of these birds at Sekwas in the Lidar valley at an elevation of nearly 12,000 ft.

(97) **Gypaëtus barbatus grandis.**—Noted throughout the length and breadth of the valley. They seemed just as much at home sailing over the steep forest-clad hillsides as alongside towering cliffs in the gorges, although of course bare crags and rock-strewn slopes above the tree-line is the type of country most usually connected with this bird's habitat.

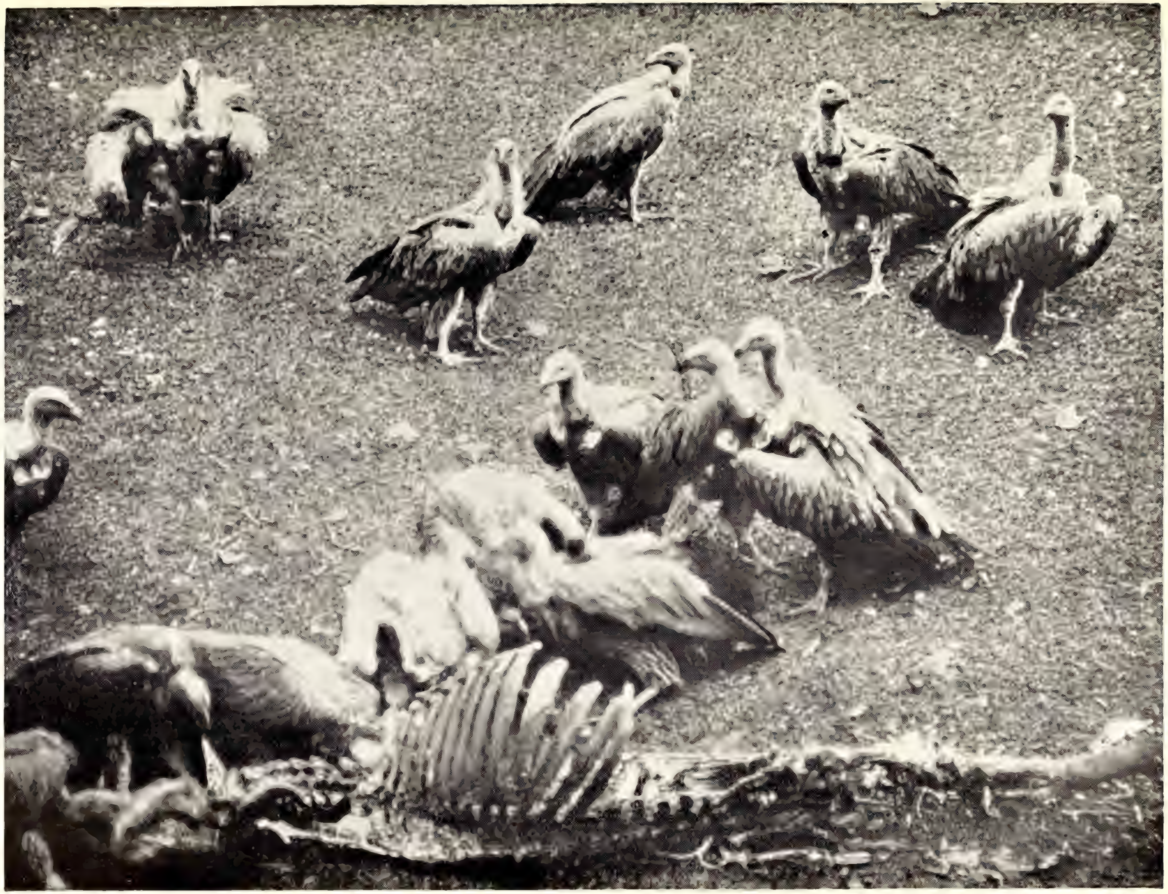
(98) **Falco subbuteo**.—One pair of Hobbies was noted over Keran on April 30. At Bagtor on May 29 I was hailed from my breakfast to deal with an obviously breeding Sparrow Hawk which had been carrying off Turtle-Doves from nearby. A Hobby had been taken for her by my servants and was sitting at the very summit of an exceedingly tall spruce fir. I managed to bring it down whereupon a second one, which I had not noticed, flew from the next tree emitting wild screams of anger. While skinning the bird procured, which was a female holding nine or ten yolks as much as one-eighth inch in diameter, a second bird, which I thought must be the male returned in search of her, flew into a pine not thirty yards off. As it sailed back towards the wood low over my head it paid the penalty for its temerity. To my surprise it was likewise a female with yolks developing, one being $\frac{3}{16}$ inch across.

(99) **Cerchneis tinnunculus**.—Kestrels, obviously breeding birds, were seen frequently whenever we passed suitable cliffs. At one point where the path took an abrupt bend over a rocky nullah and then on a wooden gallery up the face of a low cliff, I was able to look on to a sitting bird. Unfortunately some rock plants just prevented me from seeing whether there were eggs in the slight hollow in which the bird was seated. After watching for a couple of minutes its mate arrived whereupon both birds flew to a projecting rock where copulation immediately took place. This was on April 22 five miles from Dhanni at 2,900 ft.

(100) **Milvus migrans govinda**.—This Kite was seen as far as Dhanni.

(101) **Milvus lineatus.**— I came to the conclusion that all the Kites seen from Dhanni to Gurais were of this species. I saw no nests but they must breed in the Valley. I have a record of a nest containing young ones in June at 7,200 ft. in the Lidar valley.

(102) **Accipiter nisus.**—One was shot at Keran on May 5. Unfortunately its abdomen seemed to have received the full charge, and I found it impossible to tell whether it was a breeding bird or even to sex it. Another was seen on a number of occasions at Sharda between May 8 and 10. As it always returned up the forest whence it had come I did not shoot it hoping to trace a nest. In this I was unsuccessful. Again I came upon one at Bagtor which I saw fairly frequently, as its pet beat was the edge of the forest close to which the rest-house stands. On May 26 it killed a Turtle-Dove within a few yards of us, making a deep gash in its back. When we retreated it plucked the carcase most neatly and carried it off into the thick fir forest. Mounds of Dove feathers in two other places close by proclaimed the fact that other Turtle-Doves had met a similar fate very recently. Unfortunately



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Gyps himalayensis disposing of the body of a young buffalo.

I had not got the gun with me, added to which she obviously had young ones to feed.

(103) **Columba livia neglecta.**—These Pigeons were not as common as I expected them to be. Flocks were certainly noted occupying suitable ledges and caves in the rocky banks in all the more gorge-like stretches of the river e.g. in the Tithwal gorge, but I never saw them out in the fields where such occurred except at and nearing Taobat where we disturbed two parties of three.

(104) **Streptopelia orientalis ferrago**.— The first one was seen five miles short of Salkalla on April 25 when we entered some rather thick secondary jungle consisting mostly of Ilex. Thereafter they gradually became commoner until at Taobat and Bagtor they were excessively so, roosting just within the fir forests and coming out particularly in the evenings to feed on the margs and in the cultivation.

(105) **Ceriornis macrolophus biddulphi.**—The crow of this Pheasant was heard a number of times during our short stay at Sharda, May 8 to 10, and again from the thick fir forest at river level three miles beyond that place on the march to Kel.

(106) **Alectoris graeca chukar.**—Common on the steep slopes running up to the Nilam plateau at Keran.

(107) **Tringa ochrophus.**—One bird of this species was feeding in a flooded ricefield with a number of Pied Wagtails two miles beyond Pateka on April 22.

(108) **Tringa hypoleucos.**—These birds must move up to their breeding grounds very early. Single birds were seen near Salkalla on April 28 and five miles beyond Dudhnial on May 8, but on reaching the wider more placid stretches of the river halfway between Janwai and Taobat they at once became common. On May 18 shortly after leaving Taobat I came on a pair preparing a nest in some dock-leaves only four yards from the path but twenty from the river bank.

(109) **Phalacrocorax carbo sinensis.**— Noted as follows : —

April 17. A pair circling over the junction of the Kishenganga and Jhelum rivers at Domel.
April 23. A single bird flying downstream halfway up the Tithwal gorge.
April 24. A single bird flew downstream into the Tithwal gorge.
April 25. Before leaving Tithwal a bird was again seen flying into the gorge while a little later one flew upstream, possibly the same bird.
April 27. At Salkalla a Cormorant flew downstream.
May 1. At Keran (5,000 ft.) the last one was seen.

(110) **Ardea cinerea.**—On April 28 a single bird was observed perched on the summit of an isolated tall pine tree near the village of Danudra (4,670 ft.) between Salkalla and Keran. For a couple of miles just here the river is wider and less turbulent with a tree-covered large island almost opposite Danudra. I could see no signs of a Heronry.

THE MEDICINAL AND POISONOUS GRASSES OF INDIA.

BY

J. F. Caius, s.j., f.l.s.

The Gramineae are one of the largest families of plants, including about 480 genera and 5,880 species. They are found in all climates and situations, but are most numerous in temperate regions.

The medicinal and poisonous grasses of the world belong to 78 genera:—Agropyron (temperate regions of Europe and Asia); Amphilophis (tropical Asia and Africa); Anatherum (Brazil); Andropogon (tropics of both hemispheres; South Europe, North America, temperate Asia); Anthephora (Africa); Anthoxanthum (temperate regions); Aristida (all warm dry countries); Arthraxon (tropics and subtropics of the Old World); Arundinella (tropical Asia and America); Arundo (Mediterranean region; East Indies, Malay Archipelago, Central and South America, South Africa, Madagascar, New Zealand); Avena (Mediterranean region; temperate region of the eastern hemisphere); Bambusa (Eastern Asia, Australia); Beckmannia (China); Brachiaria (both hemispheres, mostly African); Bromus (temperate regions of northern hemisphere, South America); Cenchrus (tropical and subtropical regions); Cephalostachyum (North India, Malaya, Madagascar); Chloris (all parts of the world in tropical and subtropical regions); Chrysopogon (Old World tropics, West Indies); Coix (East Indies, Ethiopia; warm regions); Crossotropis (Africa); Cymbopogon (Old World tropics); Cynodon (Australia, cosmopolitan); Cynosurus (Mediterranean region; Europe, Canaries); Dactyloctenium (Tropics); Dendrocalamus (South-eastern Asia); Desmostachya (India to Syria and North Africa); Diarrhena (China); Digitaria (all warm countries); Echinochloa (warm regions of both hemispheres); Eleusine (all warm countries); Elionurus (tropical and subtropical regions of both hemispheres); Elymus (northern and southern temperate regions); Eragrostis (all warm and temperate regions); Erianthus (mainly tropical); Festuca (temperate regions); Glyceria (North America); Gynerium (South Brazil, Argentina); Heteropogon (tropical Africa and Asia to Mediterranean); Hifrochloa (temperate regions); Hordeum (temperate regions; Europe, North Africa, Asia, North and South America); Hygrorhiza (India, Ceylon, Tongking); Imperata (tropical or warm regions of both hemispheres); Lolium (temperate regions; Europe, Asia, North Africa); Lophatherum (Indo-Malaya, China, Japan); Manisuris (tropical countries; India); Melica (subtropical and temperate regions; Europe, Asia, Africa, America); Melinis (Africa); Miscanthidium (tropical Africa south of the Equator, South Africa); Nastus (Madagascar); Olyra (Africa); Oryza (tropical and subtropical regions of both hemispheres); Oryzopsis (northern hemisphere); Oxytenanthera (Africa, India, Malaya); Panicum (tropical and subtropical regions); Paspalum (all warm regions); Pennisetum (most warm dry regions; Africa); Phalaris (Mediterranean region; South Africa, California to Chile); Phragmites (almost the whole world); Phyllostachys (Eastern Asia); Poa (temperate regions); Pogonarthria (Africa); Polytoca (tropical Asia, Australia); Saccharum (tropical and subtropical regions of both hemispheres); Sasa (China); Secale (temperate regions); Setaria (warm and temperate regions); Sorghum (warm and temperate regions; Africa, India); Sporobolus (tropical and subtropical regions of both hemispheres; America); Stenotaphrum (tropics of both worlds); Stipa (tropical and subtropical regions of both hemispheres); Thelepogon (India to tropical Africa); Themeda (tropical and subtropical regions of the world); Thysanolaena (Indo-Malayan region); Triticum (Mediterranean region; temperate regions); Vetiveria (tropics of the Old World); Zea (all warm countries); Zizania (North America, North-Eastern Asia).

The medicinal and poisonous grasses of India belong to 49 genera:—Agropyron, Amphilophis, Anthoxanthum, Aristida, Arthraxon, Arundinella, Arundo, Avena, Bambusa, Bromus, Cenchrus, Cephalostachyum, Chloris, Chrysopogon, Coix, Cymbopogon, Cynodon, Dactyloctenium, Dendrocalamus, Desmostachya, Echinochloa, Eleusine, Heteropogon, Hordeum, Hygrorhiza, Imperata, Lolium, Lophatherum, Manisuris, Oryza, Oxytenanthera, Panicum, Paspalum, Pennisetum, Phalaris, Phragmites, Phyllostachys, Polytoca, Saccharum, Setaria, Sorghum, Stenotaphrum, Stipa, Thelepogon, Themeda, Thysanolaena, Triticum, Vetiveria, Zea.

I. Spikelets spicate, all unisexual, male spikes in terminal panicles or continuous with the female spikes.
  a. Fruiting spikelets enclosed in a strong nut-like polished bract ... ... Coix.
  b. Fruiting spikelets having all the inner glumes concealed within the greatly enlarged hardened outer Polytoca.
  c. Fruiting spikelets densely crowded on a cylindric spongy rachis ... ... Zea.
II. Spikelets homo- or heterogamous, 1-2-flowered, solitary or 2- rarely 3-nate, on the internodes of an articulate spike or raceme.
  Spikelets 2-nate; lower involucral glume globose ... Manisuris.
III. Spikelets with a terminal perfect flower, and one or more imperfect male or neuter below it; rachilla not produced beyond the perfect flower.
  a. Panicle contracted or spiciform; spikelets awnless Phalaris.
  b. Panicle spiciform; glumes 6, III and IV neuter, awned, stamens 2 ... ... Anthoxanthum.
IV. Spikelets panicled; rachilla not produced beyond glume III; floral glumes rigid or hard, awned.
  a. Glume III narrow, awn 3-flowered ... ... Aristida.
  b. Glume III narrow, awn entire, grain terete ... Stipa.
V. Spikelets homogamous, in compound racemes or panicles. Lower involucral glume not sunk in a hollow of the rachis.
  a. Rachis not fragile. Spikelets in a cylindric silvery thyrsus ... ... Imperata.
  b. Rachis fragile. Spikelets in a thyrsus of spiciform racemes ... ... Saccharum.

VI. Spikelets many, in solitary digitate or fascicled spikes, usually heteromorphous. Lower involucral glume not sunk in a hollow of the rachis. Margins of the lower involucral glume of sessile spikelet not inflexed.

a. Spikes 2-nate or digitate; spikelets 1-flowered ... Arthraxon.

b. Spikes digitate; spikelets 2-flowered; glume I tubercled ... ... Thelepogon.

VII. Spikelets heterogamous, 1-flowered, 2-rarely 3-nate on the whorled articulate branches of simple or compound racemes or panicles.

a. Spikelets in two superposed series; upper series of heterogamous pairs, and a terminal male, lower a whorl of 4 persistent males or neuters ... Themeda.

b. Spikelets 2-nate, or the uppermost 3-nate, spicate or panicled.

i. Sessile spikelets of all the pairs alike in sex and form throughout the spikes.

¶ Joints of rachis many, stout or slender, opaque Vetiveria.

¶¶ Joints of rachis few; spikes articulate on the obliquely truncate bearded tips of the branches of the panicle ... ... Chrysopogon.

¶¶¶ Joints of rachis very few, filiform, opaque; lodicules ciliate; grain dorsally compressed Sorghum.

¶¶¶¶ Joints of rachis and pedicles of upper spikelets linear compressed with usually a central translucent channel and thickened margins ... Amphilophis.

ii. Lowest one or more sessile spikelets differing from all those above it in sex or form.

¶ Spikes binate on the peduncle which is enclosed in a spathiform sheath; sessile spikelet dorsally compressed ... ... Cymbopogon.

¶¶ Spikes solitary, lower pairs of spikelets very unlike the upper; upper sessile spikelets cylindric ... ... Heteropogon.

VIII. Spikelets 2-flowered; upper flower bisexual, lower male or neuter, rarely both fertile.

a. Spikelets dorsally flattened, base not thickened; glumes 3 with very rarely a minute 4th ... Paspalum.

b. Spikelets panicled or spicate; lower floral glume not beaked, upper floral glume crustaceous ... Panicum.

c. Spikelets innumerable, very minute, hairy, densely crowded in the capillary branches of a very large panicle ... ... Thysanolaena.

d. Spikelets persistent on the pedicels, or glumes I and II separately deciduous, IV deciduous; usually awned, awn bent ... ... Arundinella.

e. Glumes awned from the entire acute or acuminate tip or caudate or cuspidate-acuminate. Racemes dense, more or less secund ... ... Echinochloa.

f. Spikelets articulate on their pedicels, each surrounded by an involucel of bristles ... ... Setaria.

g. Spikelets persistent on their pedicels, at least the fertile, or deciduous with their pedicels.

i. Spikelets in involucelled deciduous fascicles.

¶ Involucel of bristles ... ... Pennisetum.

¶¶ Involucel of spines connate at the base ... Cenchrus.

ii. Spikelets not involucelled, 2-seriate on a flat subarticulate rachis ... ... Stenotaphrum.

IX. Spikelets 2- or more-flowered; rachilla produced.
Spikelets 2-6-flowered; flowering glumes awned; awn subterminal or dorsal ... AVENA.

X. Spikelets panicled, 2-many-flowered; glumes very narrow, flowering glumes penicillate.
a. Rachilla elongate, glabrous; flowering glumes silkily hairy ... ... ARUNDO.
b. Rachilla very short; flowering glumes glabrous; callus with long silky hairs ... ... PHRAGMITES.

XI. Spikelets 1-many-flowered, 1-2-seriate on the rachis of a simple spike or on the long slender branches of a simple panicle. Leaves broad, tessellately nerved.
Spikelets 1-flowered, secund and articulate at the base; upper glumes empty, convolute with setiform tips ... ... LOPHATHERUM.

XII. Spikelets usually panicled, 2- or more-flowered; floral glumes 5-many-nerved, upper empty or 0; styles short.
Spikelets panicled, 3-many-flowered; floral glumes mucronate or awned, dorsally rounded, 5-9-nerved, top of ovary lobed villous ... ... BROMUS.

XIII. Inflorescence various; spikelets 2-many-flowered; flowering glumes 1-3-nerved, entire, 3-toothed, 3-lobed, or 3-awned. Floral glumes entire; acute or acuminate ... ... DESMOSTACHYA.

XIV. Spikelets 1- or more-flowered, biseriate and secund on an inarticulate spike or on the spiciform branches of a slender panicle; flowers all or the lower only bisexual.
a. Spikes digitate, 1-flowered, upper imperfect flower absent ... ... CYNODON.
b. Spikes solitary, spicate or racemed; spikelets 2- or more-flowered, upper flower imperfect ... CHLORIS.
c. Spikes digitate or whorled; spikelets 3-6-flowered, densely crowded, awnless ... ... ELEUSINE.
d. Spikes terminating with a sharp point; upper involucral glume and floral glumes rigidly mucronate or shortly awned ... ... DACTYLOCTENIUM.

XV. Spikelets 1-flowered, articulate on their pedicels and deciduous from them; palea 1-3-nerved, stamens 6 or fewer.
a. Spikelets bisexual, awned; glumes 2, narrow, thin HYGRORHIZA.
b. Spikelets bisexual, awned or not; glumes 4; I and II minute or setaceous ... ... ORYZA.

XVI. Spikelets sessile, singly or in clusters; florets 1 or more.
a. Flowering glumes 5-9-nerved, lateral nerves not conniving; short or ending in teeth or awns ... TRITICUM.
b. Flowering glumes 5-7-nerved, lateral nerves conniving or confluent with the single terminal awn AGROPYRON.
c. Spikelets solitary at the nodes of the spike, 3-many-flowered; glumes coriaceous, lower involucral absent, except in the terminal spikelet; floral glumes 5-many-nerved ... ... LOLIUM.
d. Spikelets in groups of 3 at the nodes of a dense spike; floral glumes 5-nerved ... ... HORDEUM.

XVII. Shrubby or arboraceous grasses. Leaves flat jointed on the sheath.
a. Pericarp thin, adnate to the seed.
i. Stamens 3; spikelets 1-4-flowered, spicate; empty glumes 2-3 ... ... PHYLLOSTACHYS.

ii. Stamens 6; filaments free; paleas entire or slightly cleft, all 2-keeled ... .. BAMBUSA.

iii. Stamens 6; filaments connate. Spikelets few-flowered, palea of upper flower absent or glume-like, not keeled ... ... OXYTENANTHERA.

b. Pericarp crustaceous; seed free; spikelets 2-many-flowered; palea 2-keeled, lodicules none; ovary hirsute at the top ... ... DENDROCALAMUS.

c. Fruit oblong, beaked, pericarp thick, separable. Spikelets 1-flowered, bracteate, crowded in globose heads ... ... CEPHALOSTACHYUM

AGROPYRON.

This genus numbers 45 species, inhabiting mainly the temperate region of Europe and Asia.

Agropyron repens Beauv. (=*Triticum repens* Linn.) is found in Kashmir and Western Tibet, ascending up to 14,000 ft. in the Karakoram Range. This grass is a native of Europe, where it is found freely in road-sides, fields and waste places. The commercial supplies come largely from England and Germany. The plant now abounds in meadows and cultivated grounds in the northern United States of America, where it is often very troublesome as a weed. 'This grows in gardens and arable lands, as an infirmitie or plague of the fields, nothing pleasing to husbandmen; for after the field is plowed, they are constrained to gather the roots together with harrowes and rakes, and being so gathered and laid upon heaps, they set them on fire lest they should grow againe.'

'Although that Couch-grasse be an unwelcome guest to fields and gardens, yet his physicke vertues do recompense those hurts. Couch-grasse healeth green wounds.'

The plant has been employed in England from remote times as a vulnerary, and to remove difficulties of urination. 'Being boiled and drunk it openeth obstructions of the liver and gall, and the stoppings of urine, and easeth the griping pains of the belly, and inflammations; wasteth the matter of the stone in the bladder, and the ulcers thereof also. The seed doth more powerfully expel urine and stayeth laxes and vomiting. The distilled water alone, or with a little worm-seed, killeth the worms in children.

'The way of use is to bruise the roots, and having well boiled them in white wine, drink the decoction; it is opening, but not purging, very safe; 'tis a remedy against all diseases coming of stopping, and such are half those that are incident to the body of man; and although a gardener be of another opinion, yet a physician holds an acre of them to be worth five acres of carrots twice told over.'

In modern days an infusion of the root is generally regarded as a soothing diuretic, helpful to the bladder and kidneys. Formerly, this was a popular drink to purify the blood in spring. The decoction may be made from the whole fresh plant, or from the dried root sliced, two to four ounces being put in a quart of water, reduced to a pint by boiling. A wineglassful of this may be given for a dose. It certainly palliates irritation of the urinary passages, and helps to relieve against gravel. A liquid extract is also dispensed by the druggists, of which one or two teaspoonfuls are given in water.

In Europe the decoction is used to a considerable extent as a diluent and slightly nutritious drink. The French specially value it for its stimulating fragrance of vanilla and rose perfumes.

The rhizome is officinal in the pharmacopeias of France, Switzerland and Turkey. It is diuretic, demulcent and aperient. It exerts an influence upon the genito-urinary organs, and it is used internally as a demulcent drink for irritable bladder, and also for cystitis. It is one of the least stimulant of the remedies of its class, and may be employed very freely. It is also recommended in gout and rheumatism.

The rhizome contains grape sugar, fruit sugar, a sugar of undetermined identity, gum and inosite. It is also said to contain glucosides, one of which yields vanillin on hydrolysis, also a carbohydrate resembling inulin which has been named *triticin.*

Brahui: Milinj—; *Catalan*: Agram, Gram—; *Chinese*: Se Mao Ts'ao—; *Dutch*: Kweek—; *English*: Couch Grass, Dog Grass, Quack-grass, Quick Grass, Quilch, Twitch Grass, Witch Grass—; *French*: Agram, Agropyre rampant, Auge, Blé sauvage, Chiendent, Chiendent des boutiques, Chiendent officinal, Chiendent ordinaire, Froment rampant, Herbe à deux bouts, Laitue de chien, Petit chiendent, Sainte neige, Tranuge, Vagon, Wagon—; *German*: Ackergras, Ackermannswurzel, Bagenwurzel, Fadenwurzel, Fegwurzel, Flechtgras, Graswurzel, Haarstrang, Hundsgraswurzel, Hundsruecken, Knotengras, Kriechweizen, Landdreck, Paeden, Peden, Peyer, Poeden, Queck, Rebel, Ribel, Schnur, Schweinegras, Sehnengras, Spulwurz, Tuerkisches Gras, Weisswurz, Wreeten, Wuemgras, Wurmgras, Zweckenwurzel—; *Greek*: Agrostis—; *Italian*: Caprinella, Dente canino, Graminga, Granacina—; *Polish*: Perz—; *Portuguese*: Grama—; *Provence*: Grame—; *Roumanian*: Albeiu, Iarba caineasca, Pir—; *Russian*: Eja, Pirei, Porei—; *South Africa*: Couch Grass, Dog Grass, Triticum—; *Spanish*: Grama, Grama de las boticas—; *Swedish*: Quick hwete—; *Tasmania*: Couch—; *Turkish*: Ayrikotu—.

AMPHILOPHIS.

This genus consists of 25 species or more, distributed throughout tropical Africa and Asia, many of them closely allied and difficult to differentiate.

Amphilophis odorata A. Camus (=*Andropogon odoratus* Dna. Lisboa) is found in the Deccan, where it is considered carminative.

Bombay: Ushadhana—.

ANTHOXANTHUM.

The genus includes 4 or 5 species, natives of Europe and temperate Asia; one being found also in North America and Australia.

Anthoxanthum odoratum Linn. is a native of Europe and Central and Northern Asia occasionally found in the hill districts of India, but only as introduced by man or as an escape from cultivation. It is found in North Africa and the Atlantic Islands. Naturalised in North America it occurs as a meadow grass in pastures from Washington to California.

This grass is specially provocative of hay fever and hay asthma with persons liable to suffer from these distressing ailments. Accordingly a medicinal tincture is made from it with spirit of wine, and if some of the same is poured into the open hand-palms for the volatile aroma to be sniffed well into the nose and throat, immediate relief is afforded during an attack. At the same time three or four drops of the tincture should be taken as a dose with water, and repeated at intervals of twenty or thirty minutes, as needed.

The flowers contain *coumarin*, and their volatile pollen impregnates the atmosphere in early summer. But, strange to say, while the plants growing in spring have a delightfully characteristic odour and a pleasant aroma, those flowers which appear late in autumn emit a most nauseating odour.

English: Pig Grass, Sweet-scented Grass, Sweet-scented Spring Grass, Sweet-scented Vernal Grass, Sweet Vernal Grass—; *French*: Flouve odorante—; *German*: Ruchgras—; *Italian*: Paleino odoroso, Paleo—; *Uruguay*: Grama de olor—.

ARISTIDA.

It is assumed that this genus includes about 300 species, natives of warm countries.

Aristida adscenscionis Linn. is found throughout the plains and low hills of India, Burma and Ceylon, ascending to 8,000 ft. in Kashmir; it is distributed over most warm countries.

In Madagascar an ointment consisting of lard and the ashes of the flowers is used topically for itch and ringworm.

Hova: Horombavy, Pepaka—; *Southern Nigeria*: Oka olongo—.

ARTHRAXON.

The genus consists of 20 species distributed throughout the tropics and subtropics of the Old World.

Arthraxon ciliaris Beauv. is found in the hilly districts of India from Kashmir eastwards to Burma, ascending the Himalaya to 5,500 ft., and southwards to the Nilgiri Hills and Ceylon. It extends to southern and central China, and Shantung.

The plant is used medicinally in various parts of China.

Bombay: Turade, Turde—; *Chinese*: Chin Ts'ao—.

ARUNDINELLA.

This genus consists of about 55 species, found mainly in Tropical Asia and America.

Arundinella brasiliensis Raddi occurs throughout the hilly parts of India, from the Himalaya, ascending to 7,000 ft., to Burma and Ceylon. It is distributed to China, Malaya, Australia, South Africa, South Europe, tropical America.

The natives of Basutoland use the plant in compounding many medicines and in making a lotion for washing wounds.

Bombay: Dundi, Kotir—; *Suto*: Mahlakamane—.

ARUNDO.

This genus includes 12 species, natives of the Mediterranean region, and distributed to the East Indies and the Malay Archipelago, Madagascar, New Zealand, Central and South America.

Arundo donax Linn. is found in the Lower Himalaya from Kashmir to Nepal, ascending to 3,500 ft., from the Punjab to Sylhet, the Naga Hills up to 5,000-8,000 ft., Burma, the Circars, Coorg, the Nilgiri Hills. It extends westwards to Europe, North Africa and North Asia.

The rhizomes are much used in decoction as an emollient and diuretic. They are said to stimulate the menstrual discharge and diminish the secretion of milk.

Catalan: Canya—; *Egypt*: Busfarisk, Bus haggai, Buz haggni, Ghab, Gub-rumy, Gasab—; *English*: Common Reed, Giant Reed, Great Reed, Reed, Spanish Cane—; *French*: Canne de Provence, Donax, Grand roseau—; *Greek*: Kupho Kalamo—; *Indo-China*: Cong, Cuoi, Dich lo chuc—; *Italian*: Canna—; *Maltese*: Kasba—; *Portuguese*: Canna—; *Spanish*: Caña comun—; *Sokoto*: Gabara, Machara, Wutsiyar giwa—; *Yemen*: Kassab—.

AVENA.

This genus numbers about 55 species found chiefly in temperate regions.

A. fatua Linn., *A. sativa* Linn., *A. sativa* var. *orientalis* Hook. f. are used medicinally in Europe; *A. fatua* Linn. is also used in China.

1.	Ligule short, very obtuse, up to 3 mm. long ...	*A. fatua.*
2.	Ligule truncate, 1-3 mm. long	*A. sativa.*

1. **Avena fatua** Linn. is found in the Punjab, North-Western Himalaya, and Western Tibet, in cultivated fields, ascending to 9,000 ft.; also in Sikkim Himalaya up to 9,000 ft. It is distributed to temperate Europe, Northern Africa and Northern Asia.

In Europe the seeds are used for their emollient, refrigerant, and diuretic properties.

In the Punjab the seed is believed to produce poisonous and deleterious effects.

Arabic: Bakhragan, Basheruk, Ghallash sheytany, Khafur, Shair-el-ghul, Sabus ssabbaras, Zommeyr—; *Catalan*: Cugula—; *Chinese*: Ch'iao Mai—; *Egypt*: Chafur, Sammeir—; *English*: Drake, Wild Oat—; *French*: Avéneron, Averon, Avoine bouffe, Avron, Coquiolle, Couyonne, Folle avoine, Pied de mouche—; *German*: Windhafer—; *Greek*: Agrio genima—; *Hindi*: Gandal, Ganer, Jei, Kuljud—; *Iraq*: Dosar, Shofan, Sunaislah—; *Italian*: Lippa—; *Jhalawan*: Gandamkao—; *Kurdish*: Gia brishi, Kaltas—; *Languedoc*: Coughioulo—; *Mosul*: Hurtuman—; *Punjab*: Ganerjei, Gozang, Kasamm, Upwa, Yupo—; *Roumanian*: Odos—; *Russian*: Jivoi ovios—; *Spanish*: Avena loca, Cula—; *Turkish*: Chodar—.

2. **Avena sativa** Linn. is cultivated in Northern India, from Bengal to the Indus; and in the Himalaya up to 12,000 ft. It was known to the ancients, and is now cultivated in all civilized countries; but its original locality has not been satisfactorily ascertained. It grows wild in Sicily, and is said to have been seen in the Island of Juan Fernandez, off the Coast of Chili.

'Common Otes put into a linnen bag, with a little bay salt quilted handsomely for the same purpose, and made hot in a frying pan, and applied very hot, easeth the pain in the side called the stitch.' Oats fried with bay salt, and applied to the sides, take away the pains of stitches and wind in the sides of the belly.

'A poultice made of the meal of oats, and some oil of bays added, helps the itch and leprosy; as also the fistulas of the fundament, and dissolves hard imposthumes.' A yeast poultice made by stirring oatmeal into the grounds of strong beer is a capital cleansing and healing application to languid sloughing sores.

The meal of oats boiled with vinegar and applied, takes away freckles and spots in the face, and other parts of the body. 'Otemeale is good for to make a faire and wel-coloured maid to look like a cake of tallow, especially if she take next her stomacke a good draught of strong vinegre after it.'

As a food oatmeal is apt to undergo some fermentation in the stomach, and to provoke sour eructations. Furthermore, it is somewhat laxative, because containing a certain proportion of bran which mechanically stimulates the intestinal membranes; and this insoluble bran is rather apt to accumulate.

American doctors have taken of late to extol the Oat when made into a strong medicinal tincture with spirit of wine, as a remarkable nervine stimulant and restorative: this being especially valuable in all cases where there is a deficiency of nervous power, for instance, among over-worked lawyers, public speakers, and writers.

The tincture is ordered to be given in a dose from ten to twenty drops, once or twice during the day, in hot water, to act speedily; and a somewhat increased dose in cold water at bedtime so as to produce its beneficial effects more slowly then. It proves an admirable remedy in nervous prostration and exhaustion after all febrile diseases, and in sleeplessness from nervous exhaustion. It seems to exert a very beneficial action upon the heart muscles and on the urinary organs, speedily relieving spasmodic conditions of bladder and ureter.

Catalan: Sibada—; *Dutch*: Haver—; *English*: Groats, Haws, Oat, Oats—; *French*: Avoine, Avoine cultivée, Avoine noire—; *German*: Haber, Hafer—; *Greek*: Bromi—; *Hindustani*: Jai—; *Hova*: Varintsoavahy—; *Hungarian*: Zab—; *Italian*: Avena, Vena—; *Languedoc*: Arracho, Aveino, Civada, Civado, Sibado—; *Malta*: Oats, Avena, Hafur—; *Polish*: Owies—; *Portuguese*: Avea—; *Punjabi*: Javi—; *Roumanian*: Oves—; *Russian*: Ovios—; *Spanish*: Avena—.

Avena sativa var. **orientalis** Hook. fil. is characterised by the presence of bristly hairs at the base of glume III. It is found in North-Western India, the Soane Valley, and Murshidabad.

The seeds are used in Spain as an emollient, refrigerant, and diuretic.

BAMBUSA.

This genus consists of about 73 species, occurring in Eastern Asia, Malaya, and one in Australia.

B. arundinacea Retz. is used medicinally in Guiana, *B. barbata* Trin. in Madagascar, *B. vulgaris* Schrad. in Indo-China.

B. blumeana Schult. is used as a poison in Malaya.

I. Arborescent or shrubby. Stems not spinous ... 1. *B. vulgaris.*

II. Arborescent. Stems spinous.
  a. Stem-sheaths long blade with felted hairs within. Empty glumes 0-2 ovate lanceolate acute or mucronate, many-nerved ... 2. *B. arundinacea.*
  b. Stem-sheaths short. Empty glumes 2-3 ovate acute, 3-7 nerved ... ... 3. *B. blumeana.*

1. **Bambusa vulgaris** Schrad. is cultivated throughout tropical India and in all hot countries.

The roots, the shoots, the bark and the leaves are all used medicinally in Indo-China.

The roots and the shoots are considered emollient, diuretic, diaphoretic; they are used to purify the blood, and they are commonly administered for obstruction, retention of urine, indefinite pain and syphilis. Mixed with equal parts of tobacco and betel leaves, the fresh root is macerated in oil and applied externally to hard tumours and in cirrhoses.

The astringent bark is used in haemorrhage, excessive menstruation, nausea and vomiting.

The leaves are cooling and emollient; a decoction is given in fevers, melancholia, cough and sore throat.

In Cambodia the nodes are considered bechic, astringent, tonic and depurant; they are prescribed in bronchitis, blennorrhagia, leucorrhoea, metrorrhagia and the yaws.

Bengal: Basini bans—; *Bombay*: Kallak, Vansa kalaka—; *Cambodia*: Asey, Russey—; *English*: Yellow and Green Striped Bamboo—; *French*: Bambou des jardins—; *Indo-China*: Long dau chuc, Tam vong, Tre tau, Tre vuon—; *Malay*: Buluh minyak has, Buluh pan—; *Sinhalese*: Una—.

2. **Bambusa arundinacea** Retz. is found throughout the plains and low hills of India, Burma and Ceylon, wild and cultivated. It is cultivated in the lower Himalaya and in the valleys of the Ganges and Indus.

The hollow stems of this bamboo often contain a silicious and crystalline substance known in the bazaars of India as *tabashir.* This is largely used by Hindus and Mahomedans who prize it very highly as a stimulant and aphrodisiac. It is a demulcent, tonic, aphrodisiac and pectoral, which has been found useful in cough, consumption, asthma and fever. In combination with other astringent medicines it is given in chronic dysentery and internal haemorrhages.

The most efficacious application for dislodgement of worms in ulcers is a poultice made by pounding the young shoots of the bamboo. The juice is first poured on the vermin, and the ligneous mass is applied and secured by a bandage.

Yunani practitioners consider the root a good tonic; they apply the ash to ringworm, bleeding gums and pains in the joints. In the Tamil country the root is considered diluent, the bark is used as a cure for eruptions, the leaves are given to stimulate the menstrual flow, and the tabashir is prescribed in paralysis and for flatulence.

A belief in the emmenagogue properties of the leaves is common alike in India and in China. A decoction of the leaf-bud is said to be very effective. The juice of the leaves with aromatics is given in blood vomiting. With black pepper and common salt the leaves are used to check diarrhoea in cattle.

The juice of the flower is dropped in the ear for earache, and in deafness.

A decoction of the joints is supposed to have an action on the uterus, and is used by females after delivery to cause a free flow of the lochial discharge. The same part of the plant pounded with water is applied to inflamed joints.

The Ayurvedists describe the seeds as acrid, sweet, aphrodisiac and fattening. They use them freely in biliousness, urinary discharges and all forms of poisoning.

Mhaskar and Caius have shown experimentally that the bark, the seeds and the tabashir are equally useless in the antidotal treatment of either snake bite or scorpion sting.

Annam: Tre, Tre pheo—; *Arabic*: Qasab—; *Assam*: Bnah, Kata, Koto—; *Bengal*: Bans, Bansh, Behurbans, Kautabans, Ketua—; *Bombay*: Dougi, Kalak, Mandgay, Padhai—; *Burma*: Kyakatwa—; *Canarese*: Bambu, Bidaru, Bidiru, Bidirumale, Bidru, Bidungalu, Bidungulu, Biduru, Dongi, Elubidiru, Gale, Hebbidiru, Hebbidru, Hennubidiru, Kalale, Karira—; *Cantonese*: T'in Chuk Wan, T'in Chuk Wong—; *Catalan*: Bambu—; *Central Provinces*: Kattang—; *Chinese*: T'ien Chu Huang, T'ien Chu Yuen—; *Chittagong*: Bariala—; *Deccan*: Bambu, Bhans, Chansa—; *English*: Spiny Bamboo, Thorny Bamboo—; *French*: Bambou, Bambou commun, Canne bambou—; *French Guiana*: Bambou—; *Garo*: Whahkanteh—; *German*: Bambus—; *Gond*: Katiwadur—; *Gujerati*: Toncor, Wans—; *Haldwani*: Kanwas—; *Hasada*: Katangarimad—; *Hindi*: Bans, Kantabans, Kattang, Magarbans, Malbans—; *Italian*: Bambu, Canna indiana—; *Java*: Singkara—; *Kadir*: Mula, Mulai—; *Kolami*: Katammadh, Katanga—; *Konkan*: Kalak, Padhai—; *Konkani*: Conoqui, Kanaki, Vellu—; *Korku*: Mad—; *Kumaon*: Kanta bans—; *Lambadi*: Bambu—; *Lao*: Mai pai—; *Madras*: Ponteveduru—; *Magahi*: Wanah—; *Malaya*: Thian chook wong—; *Malayalam*: Illi, Kampu, Kaniyaram, Karmmaram, Mula, Mulmulam, Pattil, Tejanam, Trinadhvajan, Valiyamula, Venu—; *Marathi*: Kallak—; *Mundari*: Katanggamad, Katanggarindd—; *Naguri*: Katangmad—; *Panch Mahals*: Vas—; *Persian*: Nai—; *Portuguese*: Bambu espinhoso, Spodio—; *Provence*: Boulou—; *Punjab*: Magae, Nal—; *Roumanian*: Bambu—; *Russian*: Bambuk—; *Sanskrit*: Bahupallava, Brihattrina, Dhanurdruma, Dhatushya, Dridhagranthi, Dridhakanda, Dridhapatra, Duraruha, Kamatha, Kantaki, Kantalu, Karmmara, Kichaka, Kilati, Kishkuparva, Kugshirandhra, Mahabala, Maskara, Mrityubija, Navagragandha, Phalantaka, Purvayoni, Pushpaghataka, Shataparva, Shatpadalaya, Suparva, Suparvan, Tajana, Tejana, Trinadhvaja, Trinaketu, Trinaketuka, Tvachisara, Tvakasara, Vadaniya, Vansha, Vanya, Venu, Yavaphala—; *Santali*: Mat—; *Sinhalese*: Kattuuna, Una—; *Spanish*: Bambu, Caña de Indias para bastones, Mambú—; *Tagalog*: Canayangtotoo—; *Tamil*: Ambal, Ambu, Aril, Bongu, Iraivarai, Kalai, Kambu kilai, Kisagam, Kulaimungil, Masukkaram, Mirittusam, Mudangal, Mulai, Mullumungil, Mundlaveduru, Mundul, Mungil, Nadimungil, Nedil, Nettil, Palandam, Panai, Pandil, Pasy, Periamungil, Perumungil, Peruvarai, Sabam, Sanagi, Sey, Tandu, Tattai, Tulai, Tumbu, Valai, Vannigaruppam, Varaimungil, Vedir, Velam, Venu, Veral, Vey, Veyal, Vindil—; *Telugu*: Bongu, Bongudu, Bonguveduru, Kichakamu, Maskaramu, Mullaveduru, Mudusuveduru, Pentiveduru, Trinadhvajamu, Veduru—; *Thana*: Kalak, Katestokar, Padai—; *Tongking*: Tre gai—; *Tulu*: Bedru—; *Upper Godavery*: Kanka—; *Urdu*: Bansa—; *Uriya*: Beudobaunso, Kontabanso, Kontabaunso—; *Uruguay*: Bambú, Caña.

3. **Bambusa blumeana** Schult. is indigenous, and also cultivated to some extent, in the open sandy country of the Malay Peninsula, at Pekan in Pahang, at Perlis and Kanga in Kedah. It extends to the Malay Islands.

The very fine hairs found on the sheath leaves of the young sprouts are prominent among Malay poisons. They are used either alone or in combination with other things.

Malay: Buloh duri, Buluh duri—.

BROMUS.

This genus numbers about 40 species, found mostly in the temperate regions of the Northern hemisphere and of South America, several in the high mountains of the tropics.

B. catharticus Vahl., a Peruvian plant, is said to be purgative, and *B. purgans* Linn. of Canada is reputed emetic.

Bromus mollis Linn. is found in North-West India, Europe, the Mediterranean region as far as Persia, Western Siberia, Japan and the Atlantic Islands. It is naturalised in North and South America.

The grains of this plant bring on giddiness in man and the quadrupeds, and are fatal to poultry.

English: Bull-grass, Goose-corn—; *Italian*: Spigolina—; *Maltese*: Hortan, Hurtan—.

CENCHRUS.

This genus consists of about 25 species, found in the warm regions of both hemispheres, and in temperate North America.

Cenchrus catharticus Del. occurs in the Punjab and in the Upper Gangetic Plain. It is found in Perim Island, at the mouth of the Narbada River, and is distributed over Arabia, and tropical Africa.

In La Reunion a decoction of the fruits is taken as a diuretic and pectoral.

Bombay: Baront, Kukar—; *Hausa*: Karangiya—; *La Reunion*: Gratte-cul, Pagode—; *Rajputana*: Bharut—; *Sudan*: Cram-cram, Heskanit—.

CEPHALOSTACHYUM.

This genus numbers 8 species inhabiting North India, Malaya and Madagascar.

Cephalostachyum capitatum Munro is found in the Sikkim and Bhutan Himalaya at 2,000-8,000 ft., and also in the Kasia, Jaintea and Naga Hills.

The leaves are much used medicinally in Madagascar. The infusion, 60 leaves for a litre of water, is given as tonic, anthelmintic, stomachic and carminative. An ointment consisting of 20 parts of ash and 30 parts of lard or suet is applied for the itch and for rheumatism.

Betsimisaraka: Volozatsy, Volozevona—; *Lepcha*: Pa-yang, Pa-yong—; *Madagascar*: Volo, Volotsangana—.

CHLORIS.

This genus contains 75 species found in the tropical and subtropical regions of both hemispheres.

C. petraea Thunb. yields hydrocyanic acid.

Chloris virgata Sw. is found abundantly in Rajputana, Upper and Lower Gangetic Plains, southwards to Bihar, Central and Southern India, Burma, Western Tibet. It extends westwards to Algeria, and is distributed over China, Mongolia, Tropical and South Africa and America.

A decoction of the plant or of its roots is used by the Xosas of South Africa as an addition to baths for the treatment of colds and rheumatism.

Rajputana: Gharaniagas—; *Nigeria*: Kafar gauraka, Kafar fakar, Sawun gauraka—; *Telugu*: Uppugaddi—; *Transvaal*: Sweet Grass, Zoet Grass—; *Xosa*: uMadolwana—.

CHRYSOPOGON.

This genus consists of about 18 species found in the hot parts of the Old World, a few extending into the temperate zones; one in Florida and Cuba.

Chrysopogon serrulatus Trin. occurs in the Western Himalaya, from Kashmir to Nepal, ascending to 6,000 ft. It is found in the hilly districts from the Punjab to Bihar and Orissa, Burma and southwards to Ceylon. It extends to Indo-China, Afghanistan, Portuguese East Africa, Madagascar, Rhodesia and South Africa.

The plant is said to yield hydrocyanic acid. The seeds are a popular vermifuge in Annam.

Annam: Bong co, Co may, Co mu, Nam hoang lien—; *Indo-China*: Chiendent grenille—; *Jhalawan*: Kaj—; *Kharan*: Kohigayab—; *Kila Saifulla*: Sabba—; *Nushki*: Kuj—; *Pab*: Kaj—; *Quetta*: Kohigayab—.

COIX.

The genus includes 5 or 6 species, natives of the East Indies and Ethiopia, one being broadly dispersed in warm regions.

Coix lachryma-jobi Linn. is found throughout the hotter and damper parts of India and Ceylon, wild and cultivated—not wild in Ceylon. It is distributed over tropical Asia, and is cultivated in Africa and America.

Yunani doctors use the seed as a tonic and diuretic. In Western practice the seeds are given as a tincture or decoction in catarrhal affections of the air passages and in inflammation of the urinary passages. In Tongking they are considered a good blood purifier and an excellent diuretic.

The kernels deprived of their shells are used as a food and medicine throughout China, Malaya, Indo-China, the Philippine Islands, and in La Reunion. They make an excellent diet drink for invalids, and have diuretic and cathartic properties. They are also employed for lung and chest complaints.

Among the Santals the root is given in strangury and in the menstrual complaint known as 'silka'.

An infusion of the parched and ground grains is used instead of tea by the Japanese. The Chinese consider the toasted seeds to be tonic and diuretic; they prescribe them in blennorrhagia.

The root is one of the ingredients in Vagbhata's snake remedy Ashtanga-agada; but Mhaskar and Caius have shown experimentally that the drug is not an antidote to snake venom.

Arabic: Damudud—; *Ashanti*: Akrokosaibia—; *Assam*: Koamonee, Sohriu—; *Balaghat*: Gurlu—; *Bengal*: Gurgur, Jilgurgur, Julgurgur, Kunch—; *Bombay*: Gurgur, Kardia, Kassaibija, Kassar, Keruch, Ranjondhla, Ranmaka—; *Bundelkhand*: Ganddula, Garun—; *Burma*: Cheik, Kalithi, Kyeikphun, Kyeit, Sakyeik—; *Cachar*: Jhonki—; *Central Provinces*: Galbi, Ganddula, Kasei—: *Chanda*: Gadi, Galbi, Kasei—; *Chinese*: I I Jen, Kiai Li, T'u I Mi, Y I Mi—; *Cutch*: Dhamra—; *Egypt*: Dimma ayub—; *English*: Christ's Tears, Job's Tears—; *Fiji*: Sila—; *French*: Larme de Job, Larmillé des Indes—; *Gond*: Kasai—; *Gujerati*: Kasai, Ranzondlo—; *Hindi*: Baru, Dabhir, Ganduta, Garahadua, Gargaridhan, Garun, Gulbigadi, Gurlu, Jilgurgur, Julgurgur, Kaiya, Kansh, Kasei, Sanklu, Sankhru, Sankru—; *Igorotte*: Agda—; *Indo-China*: Bo bo hoang, Cuom gao, Neang vong, Y di—; *Jaintia Hills*: Sohriu—; *Japan*: Judsudama, Tomugi—; *Karen*: Be, Bema—; *Khasia Hills*: Sohriu, U sohriew—; *Konkani*: Ranzondlo, Ranzonnalo—; *La Reunion*: Job—; *Lepcha*: Kun-dap, Tung-lin—; *Lushai Hills*: Mim—; *Malay*: Jilai batu, Mulai tikus, Ringuiringui—; *Malaya*: Yee mai, Yee yin—; *Malta*: Dmuh ta Giobb, Hara tac Ciaul, Job's Tears, Lacrima di Giobbe, Zibeg tal curum—; *Manipur*: Changmimkhombi, Mim, Mung—; *Marathi*: Ranjondhala, Ranmakkai—; *Matheran*: Kasai, Ranmaka—; *Mexico*: Acayacoyotl—; *Mount Abu*: Dabhir—; *Mundari*: Bakrihoreng, Horeng, Loeonghoreng—; *Naga Hills*: Kasi, Kesi, Koasangti, Kudhati, Kudhiathia, Sikrakravu, Sotsa—; *New Caledonia*: E'Houa—; *North-West Provinces*: Sankru—; *Philippines*: Alimodias—; *Poona*: Jondhali—; *Porto Rico*: Camandula—; *Portuguese*: Lagrimas de Job—; *Punjab*: Sanklu—; *Rajputana*: Dabhir—; *Ranchi*: Danghir—; *Sabathu Hills*: Sanklu—; *Saharanpur*: Baru—; *Samoa*: Maniusniu, Samasama—; *Sanskrit*: Gaberu, Gavedhu, Gavedhuka, Gavedu, Gojivha, Gundraguttha, Jargadi, Kshudra, Kunta—; *Santali*: Jargadi—; *Sema*: Akiti—; *Seoni*: Galu—; *Sierra Leone*: Boukon, Boukori, Ewaruwura, Kali bugi—; *Sinhalese*: Karibu, Kikirindi, Kikirindimana, Kukirrindi—; *Spanish*: Lagrimas de San Pedro—; *Tagalog*: Tegbe, Tigbi—; *Tamil*: Kattu-kundamani—; *Twi*: Owu-ammangmankang-m'asaim—; *Uruguay*: Lagrima de Cristo, Lagrima de Job, Lagrima de Maria—; *Visayan*: Adlay—.

CYMBOPOGON.

This genus consists of about 36 species distributed throughout the tropical, and more rarely the subtropical, regions of the Old World.

C. winterianus Jowitt is officinal in Germany.

C. schoenanthus Spreng. is used medicinally in China, Guinea, Madagascar and Guiana; *C. nardus* Linn. in Cambodia, Guinea and Madagascar; *C. citratus* Stapf. in the Gold Coast; *C. excavatus* Stapf., *C. marginatus* Stapf., *C. validus* Stapf. in South Africa.

A. Basal leaf-sheaths ultimately loosened and curled; blades flat; raceme-fascicles compound ... 1. *C. jwarancusa.*

B. Basal leaf-sheaths in dense tufts, tightly clapping, thickened below; blades more or less filiform and flexuous, except when very short; raceme-fascicles more or less simple ... ... 2. *C. schoenanthus.*

C. Sessile spikelets lanceolate or ovate- or obovate-lanceolate; back flat. Lowest pedicel of raceme scarcely stouter than the upper. All the spikelets awnless ... ... 3. *C. nardus.*

D. Sessile spikelets linear to lanceolate-linear, awnless; back distinctly concave in the lower part; panicle usually loose; branches slender, the ultimate branchlets more or less nodding; spathes long and narrow; hairs of joints and pedicels rather spreading ... ... 4. *C. citratus.*

1. **Cymbopogon jwarancusa** Schult. (=*Andropogon jwarancusa* Jones) is found in the outer hill zone of the United Provinces, Kumaon, Garhwal, and westwards as far as Peshawar, Jodhpur and Jaisalmer, Sind, Bihar. It occurs in Western Tibet, ascending to 8,000 ft., and extends westwards to North Africa.

The plant is described by both Ayurveda and Yunani writers.

This grass is used to purify the blood, and in coughs, chronic rheumatism and cholera. It is recommended as a valuable aromatic tonic in dyspepsia, especially that of children. It is also used as a stimulant and sudorific in gout, fever and rheumatism.

The flowers are astringent and are used to stop haemorrhage.

When a Baluchi has fever, a large quantity of this grass is collected and made into a bed. He lies on it and at once begins to sweat.

Arabic: Izkhair—; *Baluchi*: Haveh—; *Bengal*: Gandhavena, Ibharankusha, Karankusa—; *Bombay*: Ibarankusa, Iwarankusa, Izkhir, Kurankusa—; *Brahui*: Have, Haveh—; *Canarese*: Kari lavancha—; *Gujerati*: Jalavalo, Khadajala, Pilovalo—; *Hindi*: Bur, Ghatyari, Ibharankusha, Karankusha, Khavi, Khawi, Khoi, Lamjak, Panni, San, Solara—; *Marathi*: Izkir, Lavaja, Pivalavala—; *North-West Provinces*: Bad, Ganguli, Misiyaban, Piriya—; *Persian*: Gurgiyah—; *Punjab*: Bur, Ghatyari, Ibharankusha, Karankusha, Khavi, Khawi, Khoi, Lamjak, Panni, San, Solara—; *Sanskrit*: Amrinala, Avadahaka, Avadataka, Dirghamula, Isthakapathika, Jalashaya, Jwarankusa, Laghu, Lamajjaka, Laya, Nalada, Sevya, Shighra, Sunala, Sunila—; *Tongking*: Co de—.

2. **Cymbopogon schoenanthus** Spreng. (=*Andropogon schoenanthus* Linn. = *A. laniger* Desf.) is found in the hotter parts of India, wild or cultivated, from the Punjab to Burma and southwards to Travancore and Ceylon. It extends to Afghanistan and through North Africa to Morocco; it also occurs in Eritrea, Socotra and Somaliland.

Ayurvedists describe the grass as acrid, bitter and pungent; useful in fevers, bronchitis, pains, leprosy, heart and throat troubles, and epileptic fits in children.

In Mahomedan medicine it is prescribed as a diuretic, emmenagogue and deobstruent, also as a stimulant to promote perspiration and expectoration.

A decoction of the plant is given as a febrifuge. It is used in China against oppression and spasmodic dyspnoea.

A strong infusion of the grass is commonly used in Egypt as an antispasmodic and diuretic, and is reputed to have valuable results, especially in promoting the passage of urethral stones.

The oil is considered a powerful stimulant when applied externally. It is used as a liniment in chronic rheumatism and neuralgia, and is believed to have the property of curing baldness.

The root and the stem are popular snake and scorpion remedies; but Caius and Mhaskar have demonstrated experimentally that both of them are useless in the antidotal treatment of either snake bite or scorpion sting.

Arabic: Izkhir, Mahareb—; *Bengal*: Agyaghas, Gandhabena, Kamakarpura—; *Bicol*: Baliyoc—; *Bombay*: Rohisha, Rosegavat—; *Cairo*: El-mahareb—; *Canarese*: Vasanchullu—; *Ceylon*: Camel Grass—; *Chinese*: Cha Yang, Che Yang, Mao Hsiang, Yang Mao Ts'ao—; *English*: Camel Grass, Camel Hay, Geranium Grass—; *French*: Barbeau musqué, Chiendent musqué, Foin de chameau, Gramen oriental, Jonc odorant, Pâture de chameau, Schoenanthe, Schoenanthe odorant—; *French Guiana*: Citronnelle—; *Fort Sandeman*: Sargarah—; *Gujerat*: Roshdo, Roshgas, Rusaghas, Rush, Rushgas—; *Hassan*: Ezkryr—; *Hedjaz*: M'haz, Ulfaz udwiyah—; *Hindi*: Bujina, Ghandhabela, Ghatyari, Gundbel, Khavi, Mirchiagand, Musel, Palakhari, Rohisha, Rousaghas, Saundhiya—; *Hova*: Fiahana, Fiahina, Fiehana, Verofehana, Veromanitra—; *Italian*: Fieno di camelo—; *Jhalawan*: Hawai—; *La Reunion*: Citronnelle—; *Las Bela*: Pui—; *Malayalam*: Sirek—; *Marathi*: Rohisha, Rosegavat, Rushgavat—; *Matheran*: Rusha—; *New Caledonia*: N'Dowi—; *North-West Provinces*: Bujina, Palakhari—; *Persia*: Gorgiyah—; *Philippines*: Paja de meca, Raiz de moras, Salaid—; *Punjab*: Ranus, Rauns—; *Sanskrit*: Bhustrina, Bhuti, Bhutika, Devajagdha, Dhupagandhika, Dhyama, Dhyamaka, Katrina, Paura, Putimugdala, Rohisha, Rohishatrina, Saugandhika, Shyamaka, Sugandhatrinashita, Sushitala—; *Shahrig*: Sargarah—; *Siwaliks*: Mirchiagard—; *Spanish*: Esquenanto, Paja de camello, Paja de la Meca—; *Tagalog*: Salai, Salay, Tanglad—; *Tamil*: Kamachipillu, Kavatampillu, Vassinapillu—; *Teheran*: Azkar—; *Telugu*: Kamachikussu—; *Visayan*: Tanglad—.

3. **Cymbopogon nardus** Linn. (=*Andropogon nardus* Linn.) occurs throughout the hotter parts of India, Burma, the Malay Peninsula, and Ceylon, wild or cultivated, common everywhere. It extends to tropical Asia, Africa and Australia.

The infusion of the leaves is used as a stomachic and carminative.

The oil is stimulant, carminative, antispasmodic and sudorific. It is used as rubefacient.

In Cambodia the flowers and the leaves are considered good against cough, and sudorific; the roots are used as a diuretic, sudorific and antiperiodic.

Bengal: Kamakher, Kurankosha—; *Burma*: Singoumia—; *Cambodia*: Sakrey, Slek Rey—; *Canarese*: Gandahanchikhaddi, Kamakshihullu—; *Deccan*: Ganjni—; *English*: Citronella Grass—; *Hindi*: Ganjni, Ganjnikaghas, Iwarankosa, Pustburn—; *Hova*: Verofehana—; *Indo-China*: Citronnelle, Hung nghe huyen, La sa, Satrey—; *Malay*: Sereh wangi—; *Malayalam*: Chorapulla, Kamakshipulla—; *Marathi*: Ganjni, Usadhana—; *Sinhalese*: Maana, Mana, Pengirimana, Watusaewendara—; *Spanish*: Espicanardo espurio—; *Tamil*: Kavattampillu, Kamachipillu, Mandappillu, Sukkunaruppillu, Sunnarippillu—; *Telugu*: Kamakshikasuvu, Kamachikussu, Kamanchigaddi—; *Zulu*: ubungu—.

4. **Cymbopogon citratus** Stapf. (=*Andropogon citratus* D.C.) is only known in the cultivated state. Probably of Indian origin it is now widely distributed over the tropics of both hemispheres.

Ayurvedists describe the grass as pungent, bitter, sharp and hot. They say it is a good laxative, an aphrodisiac and anthelmintic; useful in bronchitis, leprosy and epileptic fits.

An infusion of the leaves is a popular sudorific, stimulant, antiperiodic, very frequently given in simple catarrh. As a fever drink it has great effect in inducing a remission or intermission by bringing on sweat; and it is especially successful with weakly subjects or when the fever is of a typhoid type. It is also used as a medicinal vapour bath in mild cases of fever, or as an inhalation.

The roots and tender leaves are sometimes given with black pepper in cases of disordered menstruation and in the congestive and neuralgic forms of dysmenorrhoea.

In flatulent and spasmodic affections of the bowels, and in gastric irritability, the oil is a remedy of value. In cholera it proves very serviceable, not only by allaying and arresting the vomiting, but by aiding the process of reaction as well. Applied externally, it forms an excellent embrocation in chronic rheumatism, neuralgia, sprains and other painful affections. Externally it is also used for the ringworm.

In the Gold Coast the leaves are often boiled in water like tea, and the liquor is drunk to cure fever. It is sometimes put into hot bath water, and the patient stands in the hot vapour given off. This is also said to be a good cure for fever.

Bengal: Gandhabena—; *Burma*: Sabalin—; *Canarese*: Kavanche hullu, Majjigehullu, Purhalihulla, Vasanehullu—; *Chinese*: Mao Hsiang—; *Colombia*: Limoncillo—; *Deccan*: Hazarmasalah—; *English*: Lemon Grass, Melissa Grass—; *French*: Chiendent citronnelle, Verveine des Indes Orientales—; *Gujerati*: Lilacha, Lilicha—; *Hindi*: Gandhatrina—; *Indo-China*: Huong mao thao, La sa, Sacrey, Say sa—; *Java*: Sireh—; *Malay*: Sereh makan—; *Malayalam*: Shambharapulla, Vasanappulla—; *Marathi*: Hirvacha, Olancha, Olencha—; *Persian*: Chaekashmiri, Hazarmasalah—; *Portuguese*: Herba cheirosa, Capim de Cheiro—; *Sanskrit*: Abichhatraka, Atigandha, Badhira, Badhiradhvanibodhana, Bhustrina, Bhutina, Chhatra, Gochhalaka, Guchhala, Guhyabija, Gundardha, Jambukapriya, Karenduka, Kutimbaka, Malatrinaka, Punsvavighraha, Putigandha, Roshisha, Samalambi, Shringaroha, Sugandha—; *Sinhalese*: Penquin, Saira—; *Spanish*: Grama de limon, Limoncillo—; *Tagalog*: Tanglad—; *Tamil*: Karapurappillu, Vasanappillu—; *Telugu*: Chippagadi, Nimmagaddi, Vasangaddi—; *Venezuela*: Citronera, Limonera, Malojillo—.

CYNODON.

Of the 7 species which constitute this genus, 1 is cosmopolitan, the others Australian and South African.

C. dactylon Pers. is used medicinally in Madagascar, La Reunion and South Africa; *C. hirsutus* Stent. in Basutoland.

C. bradleyi Stent. yields hydrocyanic acid.

Cynodon dactylon Pers. is cosmopolitan and distributed through all warm countries. It is found throughout India, Burma and Ceylon, ascending to 5,000 ft. in the Himalaya.

A decoction of the root is chiefly used as a diuretic in South India and in Chota Nagpore. In Mysore it is employed for secondary syphilis.

The cold infusion of the root often stops bleeding from piles.

The roots crushed and mixed with curds are a Deccan remedy for chronic gleet.

The expressed juice of the plant is an Ayurveda specific for hysteria, epilepsy and insanity.

The expressed juice of the plant, however, is a popular astringent commonly used as an application to fresh cuts and wounds and given internally in cases of chronic diarrhoea and dysentery.

It is also diuretic and used in cases of dropsy. It has moreover been found useful in catarrhal ophthalmia.

In the Konkan the grass is prescribed in compound decoctions with more active drugs for the cure of dysentery, and abnormally profuse menstruation. A white variety, which appears to be only a diseased state of the plant, is used medicinally by the native Hindu practitioners. It is acidulous and is given to check vomiting in bilious complaints.

A preparation of the plant is applied by the Santals in a parasitic disease, which attacks the spaces between the toes.

In Madagascar the whole plant, or the rhizome alone, is applied specially in gout and rheumatic affections.

An infusion of the plant is taken as a tonic in Venezuela.

Europeans in the Transvaal use the plant for heartburn. It is taken bruised and mixed with sodium bicarbonate and other substances. The bruised plant alone is applied as a styptic to wounds.

The Xosas use a decoction as a lotion for sores and swellings.

Mhaskar and Caius have shown that the plant is not an antidote to either snake venom or scorpion venom.

Afrikaans: Batawiese kweek, Fynkweek, Kwagga, Kwaggakweek, Kruisgras, Oostindiese kweek—; *Antsianaka*: Arampandrotra—; *Arabic*: Nagil—; *Baluchi*: Milinu—; *Bengal*: Dub, Dubla, Durba—; *Betsileo*: Kindrese—; *Bombay*: Harala, Haryeli—; *Canarese*: Garikehullu, Karkeri hullu, Kudi garikai—; *Catalan*: Agram, Gram—; *Central Provinces*: Dhupsa, Hariali—; *Chinese*: Ko Oung—; *Cuba*: Grama—; *Cutch*: Chhabar, Chhabbar—; *Egypt*: Nediil, Negil, Nishil, Nisiil—; *English*: Bahama Grass, Bermuda Grass, Couch Grass, Creeping Panic Grass, Devil's Grass, Doab Grass, Dog's Tooth Grass, Doob Grass, Doorwa, Doub Grass, Dun Grass—; *French*: Chiendent pied de poule, Gros chiendent, Herbe des Bermudes, Pied de poule—; *Greek*: Agria, Agriada—; *Guam*: Grama—; *Gujerat*: Dhro, Dhrokad, Gharo, Khabbal—; *Hausa*: Kiri kiri, Tsar-Kiyar zomo, Tsirkiar zomo—; *Hawaii*: Manienie—; *Hindi*: Dhoboghas, Dub, Dubra, Durba, Huriyale, Kalighas, Kabbar, Ramghas—; *Hova*: Fandrotararana—; *Indo-China*: Co chi trang, Co ong, Hanh nghi chi—; *Iraq*: Thaiyil—; *Jhalawan*: Char, Chobi, Godmaz—; *Kolami*: Dhobighas, Dubi—; *Konkani*: Dhurva, Harialy—; *Languedoc*: Limaouça—; *Lao*: Ya Pet—; *Las Bela*: Sabah—; *Loanda*: Capim dos caballos—; *Loralai*: Sabah—; *Madagascar*: Kindresy—; *Malta*: Capriola, Couch Grass, Doub Grass, Gramigna, Nigem—; *Marathi*: Dhurva, Durva, Harialy, Karala—; *Menabe*: Fandrahana—; *Mundari*: Dubila, Dubilatasad, Dubitasad—; *Nairobi*: Uganda Grass—; *Nisirabad*: Kabb—; *North-West Provinces*: Duba, Kalighas, Ramghas—; *Pacific Coast*: Bermuda Grass, Dog's Tooth Grass, Indian Couch Grass, Scotch Grass, Wire-Grass—; *Panjgur*: Shez—; *Punjab*: Daurva, Dun, Dubra, Kabbar, Khabbal, Talla, Tilla—; *Rajputana*: Dob, Nilldub—; *Rarotonga*: Mati—; *Sadani*: Dublaghas—; *Sakalave*: Fandrotsana, Fandrotsarana—; *Sanskrit*: Amari, Amrita, Ananta, Anuvallika, Asitalata, Bahuvirya, Bhargavi, Bhutahantri, Dhurta, Dhurva, Durmara, Gauri, Guna, Harasalika, Harita, Haritali, Jaya, Kachharuha, Mahaushadhi, Mahavari, Mangala, Nanda, Niladurva, Ruha, Sahsravirya, Saumya, Shadvala, Shambhavi, Shanta, Shashpa, Shataparva, Shatagranthi, Shatavalli, Shatmula, Shita, Shitakumbhi, Shitala, Shiva, Shiveshta, Shyama, Tiktaparva, Vamini, Vijaya—; *Santali*: Dhobighas, Dubi—; *Sind*: Chhabar, Chhabbar, Chibbur—; *Sokoto*: Kirikiri, Tsarkryarzomo, Tsirikiarzomo—; *South Africa*: Bahama Grass, Bermuda Grass, Bermuda Quickgrass, Devil's Grass, Doab Grass, Dub Grass, Fine Couchgrass, Florida Grass, Germiston Grass, Scotch Grass—; *Spanish*: Grama común—; *Suto*: Mohlwa, Morara—; *Tagalog*: Cautcauran, Colatay, Malit—; *Tamil*: Arugampillu, Hariali—; *Tasmania*: Indian Couch—; *Telugu*: Ghericha, Gurka hariali—; *Trans Indus*: Burawa—; *Transvaal*: Quagga Quick—; *Upper Godavery*: Haryali—; *Urdu*: Dub—; *Uriya*: Dubbulaghanso—; *Uruguay*: Gramilla, Gramilla colorada, Gramilla del tiempo, Pata de perdiz—; *Virginia*: Wire Grass—; *West Indies*: Bahama Grass—; *Xosa*: uQuaqaqa—; *Zulu*: isiNandi, umFulwane, uNgwengwe—.

DACTYLOCTENIUM.

The genus consists of 5 species inhabiting warm regions, one widely spread throughout the tropics.

Dactyloctenium aegyptium Rich. (=*Eleusine aegyptiaca* Desf.) is spread throughout the low country of India and Burma, to Malacca and Ceylon. It is also known from Egypt, Nubia, Eritrea, Arabia and other countries of Tropical Asia and America. It was introduced into the New World from the warm regions of the Old.

The grains are used medicinally by the Mundas of Chota Nagpore; they are parched in an earthern vessel and consumed in small doses for three to eight days by women who after childbirth suffer from belly-ache.

A decoction of the seeds is renowned in Africa as an alleviator of pains in the region of the kidney, and its herbaceous parts are applied externally for the cure of ulcers.

Annam: Co chi trang—; *Australia*: Egyptian Finger Grass—; *Bombay*: Mhar, Nachani, Nagli, Natchni, Raj—; *Bundelkhand*: Makamakna, Tipakia—; *Central Provinces*: Chikara, Chotamandiya, Mathna, Utesirkum, Utesirla—; *Egypt*: Im-es-salib, Rigl-el-herbayeh—; *English*: Goose Grass—; *Hausa*: Gudegude—; *Hindi*: Makra, Makri—; *Malayalam*: Kavarapullu—; *Mundari*: Bulungcuri, Bulungkode, Bulungruti, Bulungrutui—; *Natal*: Inane—; *Philippines*: Salai maya—; *Punjab*: Bhobra, Chimbari, Chubrei, Karmadhana, Madana, Madhana—; *Rajputana*: Malicha, Maligha, Mansa—; *Sadani*: Nonmarua—; *Santali*: Suntubukrui—; *Sinhalese*: Putatana—; *South Africa*: Coast Grass, Duck Grass—; *Tagalog*: Alam—; *Tamil*: Sodi, Tamida—; *Telugu*: Muttengapillu—; *Transvaal*: Egyptian Kweek-grass, Natal Kweek-grass—; *United States*: Comb Fringe Grass, Crowfoot Grass, Little Crowfoot—; *Uriya*: Kakuriya—; *Zulu*: isiNandi, isInane, uNgwengwe—.

DENDROCALAMUS.

This genus numbers 24 species, which inhabit the Indo-Malayan region, the Philippine Islands, China and Africa.

Dendrocalamus strictus Nees is found in the dry hills of Northern India, from Garhwal to Nepal and southwards from the Punjab to Bihar, the Konkan, Central and South India, Burma and Great Cocos Island. It extends to Java.

The leaves are boiled in water for convalescents to bathe in.

A decoction of the leaves is given to aid parturition; the juice in two-ounce doses taken frequently is used as an abortifacient.

In Arabia the joints are made into a decoction and used as a medicine to procure abortion.

The minute hairs found on the sheath leaves are used by the Malays as a poison; it is given either alone or in combination with other things.

Baigas: Bhiru—; *Bengal*: Karail—; *Bombay*: Bas, Bassa, Kaban, Udha, Vassa—; *Burma*: Myinwa—; *Canarese*: Bidiru, Gandubediru, Kibbidary, Kiribidiru—; *English*: Male Bamboo, Solid Bamboo—; *Gond*: Halpa, Vadur, Veddar—; *Gujerat*: Nakorvans, Narvans, Vans—; *Hindi*: Bans, Banskaban, Banskhurd, Kopar, Lakdibans, Narbans—; *Khond*: Maringi—; *Kolami*: Burumadh, Burumat, Mathan, Saring—; *Kumaon*: Bans—; *Kurku*: Indo—; *Lambadi*: Vasi—; *Malay*: Buloh batu, Buloh berang, Buloh tempat—; *Malayalam*: Arinkantam, Cheriyamula, Kalmula, Kalmungil, Karinalimula, Karinkana—; *Marathi*: Bans, Bharilvel, Bhovarlit, Vela—; *Mundari*: Birmad, Burumad, Janggimad—; *Palamow*: Bukhar—; *Pandratola*: Kark—; *Reddi*: Kondaveduru—; *Sanskrit*: Vansha, Venu, Yavaphala—; *Santal*: Burumadh, Burumat—; *Saora*: Kondaveduru—; *Tamil*: Karanai: Kalmungil, Kattumungil, Mungil, Sinnamungil, Sirumungil, Siruvari—; *Telugu*: Chittiveduru, Gattiveduru, Kankaveduru, Penveduru, Potuveduru, Rativeduru, Sadanapaveduru, Sannaveduru, Veduru—; *Thana*: Bundi, Manwel—; *Tulu*: Lavakiri, Panjibedru—; *Uriya*: Saliabans, Saliabhanso, Salimbo, Salimbobaunso, Salimbo bhanso, Sanobaunso—.

DESMOSTACHYA.

The only species of the genus is **D. bipinnata** Stapf. (=*Eragrostis cynosuroides* Beauv.). It is found in the plains of India, from Peshawar and Sind to Burma and southwards, in hot dry places. It extends westwards to Syria, Egypt, Nubia and East Tropical Africa.

The culms are diuretic and stimulant. In the Konkan they are prescribed in compound decoctions with more active drugs for the cure of dysentery, and profuse menstruation.

Afghanistan: Drab, Kuthag—; *Bengal*: Kusha—; *Bolan*: Drab—; *Bombay*: Darbh—; *Brahui*: Drak—; *Bundelkhand*: Dabvi—; *Central Provinces*: Chir, Dabhat, Kusha—; *Egypt*: Ambarfe, Halfa, Hamarte, Gash—; *Gazechah*: Kuthag—; *Gujerati*: Dabha, Darabha—; *Hindi*: Dab, Davoli, Durva—; *Kani*: Kuthag—; *Kila Saifulla*: Sparmaghaz—; *Libya*: Halfa—; *Marathi*: Darbha—; *North-Western Provinces*: Dab, Daboi, Dhab, Kush—; *Punjab*: Dab, Dhab, Dib, Drab, Drabh, Kusa—; *Sanskrit*: Barhi, Darbha, Durbha, Garbha, Hrasva, Kurava, Kusha, Kutha, Kutupa, Pavitra, Suchyagra, Yajnabhushana—; *Shahrig*: Dab—; *Sibi*: Drab—; *Telugu*: Aswalayana, Dabha, Darbha, Durpa, Kusadarbha—; *Turbat*: Ding, Drab—.

ECHINOCHLOA.

This genus consists of 20 to 25 species distributed throughout the warm regions of both hemispheres.

E. colona Link. var. *frumentacea* Blatter and McCann, and *E. crus-galli* P. Beauv. are used medicinally in China.

1. Upper involucral glume and lower floral glume equally acute or cuspidate ... ... *E. colona.*
2. Upper involucral glume and lower floral glume cuspidate or produced into an awn, the latter more than the former. Ligule absent ... *E. crus-galli.*

1. **Echinochloa colona** Link var. **frumentacea** Blatter & McCann (=*Panicum frumentaceum* Roxb.) is cultivated over the greater part of India, up to 6,500 ft. on the Himalaya.

The plant is said to be a good remedy useful in biliousness and constipation.

America: Billion Dollar Grass—; *Baluchi*: Samako—; *Bengal*: Samrashama, Sanwa, Saon, Shama, Shamula, Syamadhan—; *Bihar*: Sama, Sanwan, Sawan—; *Bombay*: Bavto, Sama, Samuka, Sanwak, Shama—; *Canarese*: Same, Save—; *Central Provinces*: Sawa, Sema—; *Chinese*: Shan Tzu—; *Deccan*: Kangra, Kathi, Kathli, Sanwa, Saon, Sawa Shama, Shamula—; *English*: Japanese Barnyard Millet—; *Garhwal*: Jhungara—; *Gujerat*: Samo, Samoghas, Janglisamak—; *Hindi*: Samak, Sanwa, Sawa, Sawan, Shama, Shamula—; *Kashmir*: Karin, Soak—; *Khondmals*: Jhari—; *Kumaon*: Jhangora, Koni, Kungni, Mandira—; *Malay*: Padi burong—; *Marathi*: Janglisama, Samul—; *North-Western Provinces*: Jhungara, Saman, Sawan—; *Oudh*: Sama, Samei, Sanwan, Sawan, Sawanbhadeha—; *Persian*: Bajri—; *Punjab*: Chandra, Sama, Samuka, Sanwak, Sawank, Soak—; *Sanskrit*: Avipriya, Rajadhanya, Shyama, Shyamaka, Sukumara, Tribija, Trinabijottama—; *Sind*: Saon, Saron—; *Sinhalese*: Welmarukku—; *Tamil*: Kudraivallipillu, Railpillu—; *Telugu*: Bontachamalu, Bontashama, Bonthshama, Chama, Chamalu, Pala oodalu, Sawa—; *Uriya*: Samu—.

2. **Echinochloa crus-galli** P. Beauv. (=*Panicum crus-galli* Linn. =*P. crus-corvi* Linn.) is common throughout the greater part of India and Malaya; as a weed it is found throughout the warm temperate countries of the northern hemisphere. It is somewhat rare in the tropics of Africa and the New World, and south of the Tropic of Cancer.

The plant is used to check haemorrhage, and is prescribed for diseases of the spleen.

Australia: Barnyard, Cockspur Grass—; *Baluchi*: Samo—; *Bengal*: Burashama, Dul—; *Betsileo*: Ahibary, Aibary—; *Bombay*: Borur, Jiria, Pakud, Pakushama, Sawank, Todia, Tor—; *Canarese*: Kadu dabhai hullu—; *Central Provinces*: Baribhodore, Bharta, Datia, Kondabuttamgodi—; *Chinese*: Pai—; *Dutch*: Vingergras—; *Egypt*: Dineyb—; *English*: Panic Grass—; *French*: Crête de coq, Ergot de coq, Millard, Panis des marais, Panis pied de coq, Patte de poule, Pied de coq—; *German*: Hahnenfussfennich—; *Greek*: Kechri—; *Gujerat*: Adbausamo—; *Hindi*: Samak, Sanwak—; *Hova*: Farimanga, Tsimparifarifolsy, Tsimparifarifary, Tsimparifarimango, Tsimparifarimena—; *Iraq*: Dahnan, Danan, Dukhain—; *Italian*: Cresta de gallo—; *Malta*: Panickgrass, Cock's shin Grass, Panicastrella, Xrika—; *Marathi*: Sama—; *Mundari*: Camatasad, Iri—; *North-Western Provinces*: Dhand, Jalsawank—; *Punjab*: Barasanwak, Bharti, Dhand, Jarotha—; *Rajputana*: Horma, Sama, Siwan—; *Roumanian*: Bujorul—; *Sadani*: Sauna, Sawa—; *Sakalave*: Karangy—; *Sanskrit*: Jalasamaka—; *Spanish*: Daza, Mijo—; *Tagalog*: Dauadaua—; *Teulgu*: Peddawundu—; *United States*: Barnyard Grass—; *Uruguay*: Pata de gallo—.

ELEUSINE.

This genus consists of 10 species distributed over the warm regions of the eastern hemisphere, one being widely spread throughout the tropics.

E. coracana Gaertn. is used medicinally in South Africa, *E. indica* Gaertn. in Guiana and Cambodia.

1. Spike stout, often incurved, pubescent at base. Seed globose ... ... *E. coracana.*
2. Spike slender, nearly glabrous at base. Seed oblong, obtusely trigonous ... ... *E. indica.*

1. **Eleusine coracana** Gaertn. is cultivated throughout India and in many parts of tropical Africa and tropical Arabia.

Ayurveda authors describe the grain as acrid, bitter and sweet and cooling. They consider it tonic, and recommend it in biliousness and blood diseases.

The grain is generally used as an astringent.

In South Africa the Tongas and Shangaans use it along with *Plumbago zeylanica* Linn. as an internal remedy for leprosy.

Abyssinia: Talban—; *Bengal*: Marua, Murha—; *Bombay*: Nagli, Nangli—; *Canarese*: Raggi, Ragi—; *Egypt*: Bishna—; *Eritrea*: Dagussa—; *French*: Coracan, Eleusine coracana—; *Golungo Alto*: Luco, Lucu—; *Gujerati*: Bavtonagli, Navtonagli—; *Hadramaut*: Dokhn—; *Hausa*: Tamba—; *Hindi*: Makra, Mandua, Marua, Maud, Murua, Rotka—; *Katagum*: Tamba—; *Khasi*: U'raitruh—; *Kolami*: Kode—; *Konkani*: Gonddo, Nachno—; *Malayalam*: Chettipulli, Mutami—; *Marathi*: Nachiri, Nagli—; *Mundari*: Dasaikode, Dumbakode, Kode—; *Natal*: Upoko—; *Nile*: Ooleyzei—; *Northern Nigeria*: Tomba—; *North-West Himalayas*: Koda, Kodon, Kodra, Kutra—; *North-West Provinces*: Makra, Mandua, Marua, Rotka—; *Oudh*: Makra, Mandua, Marua, Rotka—; *Persian*: Mandwah—; *Portuguese*: Nachinim—; *Punjab*: Chalodra, Koda, Kodon, Kodra, Mandal—; *Sanskrit*: Bahupatraka, Bhuchara, Guchha, Kadhina, Kanisha, Lanchhana, Maliyasa, Narttaka, Nrityakunda, Ragi, Raji, Rajika—; *Santali*: Kode—; *Shangaan*: Liphokho—; *Sind*: Nachni, Nangli—; *Sinhalese*: Kurakka—; *Tamil*: Kalvaragu, Kapai, Kayur, Ragi—; *Telugu*: Chodalu, Ponassa, Ragi, Ragulu, Sodi, Tamidelu—; *Unyoro*: Bolu—; *Uraon*: Kodai—; *Uriya*: Mandia—; *Zambesi*: Marumbi, Mitchinin—; *Zanzibar*: Vimbe—; *Zulu*: uPoko—.

2. **Eleusine indica** Gaertn. is found growing throughout the plains of India and Ceylon. It is common in the tropics of the Old World. It is naturalized in the Mediterranean region, and is said to have been introduced in the New World.

The whole plant, but more especially the root, is considered sudorific and febrifuge in Cambodia. It is much used in liver complaints.

In Guiana a decoction of the plant is given to children for convulsions.

Bundelkhand: Gurchawa—; *Burma*: Hsengnomyeet, Singnomyet—; *Cambodia*: Choeung Kras—; *Central Provinces*: Godchabba, Gurragadi, Kakariya, Madanya, Malghi, Mandial—; *Cuba*: Pata de gallina—; *French Guiana*: Pied de poule—; *Golungo Alto*: Pé de galinha—; *Guam*: Umog—; *Gujerat*: Adbaunagli—; *Hausa*: Chiyawartuji, Tuji—; *Hindi*: Malankuri—; *Katagum*: Chiyawar tuji, tugi—; *Kolami*: Bir Kode—; *Kumaon*: Mandavi—; *Lagos*: Ese-kana-kana, Gbegi—; *Malay*: Rumput sambau—; *Marathi*: Ran nachani—; *Mundari*: Kodai, Sukari kodai—; *North-Western Provinces and Oudh*: Gadha, Gadhacharwa, Gathamandwi, Jhingri, Jhinjhor, Lijhar, Makraila—; *Philippines*: Baquisquisan—; *Rajputana*: Mandwa—; *Sesuto*: Moseli—; *Shahrig*: Chhabal—; *Sierra Leone*: Osoekurunyi—; *Sinhalese*: Walkurakkan—; *South Africa*: Crowfoot, Goose Grass, Wild Rapoko Grass—; *Tagalog*: Sabongsabongan, Sambale—; *Tamil*: Thipparagi—; *Telugu*: Karuchodi, Karsodi, Kuror—; *Uganda*: Kasibanti—; *United States*: Goose Grass, Yard Grass—; *Uriya*: Nandia—; *Zulu*: uMunyankomo, umNyankomo, uPoko.

HETEROPOGON.

This genus consists of about 6 species found in the tropical and subtropical regions of the whole world.

H. contortus Roem. & Schult. is used medicinally in China and South Africa.

Heteropogon contortus Roem. & Schult. (=*Andropogon contortus* Linn.) is found in all warm regions. It is distributed throughout India, Burma and Ceylon to the Straits of Malacca, ascending the Himalaya to 5,000 ft. It is common throughout the whole Tropical Africa, and the adjacent islands, ascending in Eritrea to over 8,800 ft. It extends all over Africa, the Mediterranean region, and the tropical and subtropical regions generally.

The root is a stimulant and diuretic.

The Sutos of South Africa use the plant with *Tribulus terrestris* Linn. for the treatment of rheumatism in the hands.

Afrikaans: Steek Grass—; *Bihar*: Chorant—; *Bombay*: Bal, Bale, Daklisuckal, Italisuckal, Musaneh, Pendrisuckali, Suckal, Suckali kussal, Suckeri—; *Canarese*: Kari vunugada hullu, Sunkari hullu—; *Chinese*: Ti Chin—; *English*: Spear Grass, Wild Oats—; *Ga*: Akorsorfeng, Ananugangi—; *Gujerat*: Dhabsuliyum—; *Hausa*: Bunsurundaji—; *Hawaii*: Pili—; *Hindi*: Kher, Saral, Shurighas, Shurval—; *Ho*: Saiyu—; *Kharwar*: Chorant—; *Kohlu*: Barwu—; *Marathi*: Kant egawta—; *Matheran*: Bal, Kusal, Pandrisukal—; *Mundari*: Sauri—; *Ormara*: Abdarka—; *Sambalpur*: Sukla—; *Santali*: Saurighas—; *Sesuto*: Selokana—; *Shahrig*: Barwaz—; *Somaliland*: Aggar—; *Tamil*: Karunsipullu, Panipullu, Usipullu—; *Telugu*: Dubbagasarigaddi, Eddigaddi, Kaserigaddi, Yedda, Yeddi, Yerragoyi—; *Uriya*: Dauria, Sinkola, Sinkolo—; *Zulu*: isiTupe—.

HORDEUM.

This genus numbers about 25 species, natives of temperate regions, mainly found in the northern hemisphere.

Hordeum vulgare Linn. is cultivated chiefly in North India and up to 13,000 ft. in the Himalaya. It is widely cultivated in all temperate regions.

Both Ayurveda and Yunani writers credit barley with antibilious, antispasmodic, and antifebrile properties, and recommend its use in the treatment of bronchitis.

Barley is demulcent, and easy of digestion, and is for these reasons used in the dietary of the sick. A powder of the parched grains is much employed in the form of a gruel in cases of painful and atonic dyspepsia.

In Patna the ashes of the leaf are employed in the formation of cooling sherbets. The ashes of the stalks are prescribed for indigestion in the plains of the Punjab.

From the earliest times barley has been employed to prepare drinks for the sick, especially in feverish disorders, and for sore lining membranes of the chest. Barley in the form of the decoction popularly known as *barley water*, affords a mucilaginous drink very valuable in all cases requiring demulcent treatment. Pearl barley is the form usually preferred for the preparation of the decoction, made by pouring four pints of boiling water on two Troy ounces of pearl barley and boiling away to two pints, and straining. It is especially used in infant feeding, as it seems to prevent the formation of large milk curds by its colloidal character.

Pearl barley is the seed deprived of all its investments and afterwards rounded and polished in a mill. It is in small round or oval grains, having the remains of the longitudinal furrow of the seeds, and of pearly whiteness. It is wholly destitute of hordein, and abounds in starch, with some gluten, sugar and gum. This is the proper form of barley for medicinal use.

Honey may be added beneficially to the decoction of barley for bronchial coughs. Barley water with gum arabic, one ounce of the gum dissolved in a pint of the hot decoction, is a very useful drink to soothe irritation of the bladder and of the urinary passages.

Barley meal is formed by grinding the seeds previously deprived of their husk. It may be made into a coarse, heavy, hard bread, which in some countries is much used for food, though apt to purge.

In China barley sprouts are especially prepared for medicinal use. This is done by moistening the grains with water, allowing them to germinate, and then drying them in the sun. The sprouts are rubbed off and the grain ground into flour. The sprouts enter into a number of prescriptions given for infantile complaints.

The germinated barley or malt with the radicle is used in China as peptic, stomachic, lenitive, demulcent and expectorant. Preparations of malt have acquired some reputation of late years in Europe and America, since they are more demulcent and nutritious than those of the unmalted barley.

Barley is officinal in France, Portugal, Spain and the United States of America.

Afghanistan: Jao, Jaoshirin, Jaotush—; *Arabic*: Shaair, Shair—; *Armenian*: Kari—; *Ashkobi*: Arbus—; *Bagwana*: Brehnajau—; *Behar*: Jowakhar—; *Bengal*: Jab, Jao, Jau—; *Bhotia*: Nas—; *Bombay*: Jav, Satu—; *Brazil*: Cevada, Cevada sancta—; *Burma*: Muyau—; *Canarese*: Javegodhi—; *Catalan*: Ordi, Ordi comú—; *Chinese*: Kung Mai, No Mai, Ta Mai—; *Danish*: Byg—; *Deccan*: Satu—; *Dutch*: Gerst—; *Egypt*: Shair—; *English*: Barley—; *Finland*: Ohva—; *French*: Béchette, Blé d'Egypte, Blé de mai, Epeautre, Epente, Epinte, Espigan, Orge, Orge commune, Orge grosse—; *German*: Garsten, Geste—; *Greek*: Krithari, Krithi—; *Gujerati*: Jau, Jav, Ymvah—; *Harboi Hills*: Jau, Sa, Urbusha—; *Hindi*: Jau, Jav, Jawa, Suj—; *Hungarian*: Arpa—; *Indo-China*: Dai mach, Lua mach nha, Ta me, Thoc mach nha—; *Iraq*: Sha'ir—; *Italian*: Farro, Orzo, Scandella, Spelita, Spelta—; *Jhalawan*: Jau, Sa, Urbusha—; *Kila Saifulla*: Jau, Sa, Urbusha—; *Konkani*: Cevad, Jav—; *Kurdish*: Ju—; *Languedoc*: Espeulto, Espigan, Feraje hordi, Ordi, Ordigal—; *Lapland*: Kordne—; *Lassa*: Soah—; *Malaya*: Mai ngai—; *Malta*: Barley, Orzo, Xghei, Xghei tal birra, Xghei tal mazza—; *Marathi*: Cevad, Jav, Java, Satu—; *Nepal*: Tosa—; *North-West Provinces*: Indarjau, Jau, Yurk—; *Persian*: Jao—; *Polish*: Jenczmien—; *Portuguese*: Cevada—; *Punjab*: Buza, Chak, Chang, Chung, Jaon, Jau, Jawa, Nai, Thanzatt—; *Roumanian*: Orz—; *Russian*: Jetschmen—; *Sanskrit*: Akshata, Dhanyaraja, Divya, Hayapriya, Hayeshta, Kanchuki, Medhya, Pavitradhanya, Praveta, Shaktu, Shvetashunga, Sitashuka, Sitrishuka, Tikshnashuka, Turagapriya, Yava, Yavaka—; *Sharig*: Jau, Sa, Urbusha—; *Spanish*: Cebada, Cebada común—; *Swedish*: Biugg—; *Tamil*: Barliyarisi, Barliyarishi—; *Tartary*: Arpah—; *Telugu*: Barlibiyam, Dhanyabhedam, Pachchayava, Yava, Yavaka, Yavala—; *Turkish*: Arpa—; *Urdu*: Jav—; *Yemen*: Schair—.

HYGRORHIZA.

H. aristata Nees., the only species of this genus, is found in the upper and lower Gangetic Plains, Assam, Chittagong, Pegu, the Deccan and Ceylon, extending to Tongking. It occurs either floating on the surface of water, or creeping on wet ground.

Ayurveda describes the seeds as sweet and acrid, oleagenous, digestible and cooling. They are astringent to the urinary tract, and useful in biliousness. They cause constipation and flatulence.

Bengal: Uridhan—; *Bombay*: Deobhat, Urodhan—; *Canarese*: Jyarahumedhe—; *Gujerati*: Vanti—; *Hindi*: Janglidal, Tili, Tini—; *Malayalam*: Nirvallipullu—; *Marathi*: Deobhata—; *North-Western Provinces*: Parsal, Passahi, Passai, Passari, Tinni—; *Punjab*: Pastal—; *Sanskrit*: Aranyadhanya, Aranyajali, Munidhanya. Nivara, Prasadhika, Trinadhanya, Trinodbhava, Vanavrihi—; *Sinhalese*: Gojabba—; *Tamil*: Valli pullu—.

IMPERATA.

This genus consists of 5 tropical species found in the warm regions of both hemispheres, but chiefly American.

Imperata arundinacea Cyrill. (=*I. cylindrica* Beauv.) is found in the hotter parts of India, from the Punjab southwards and eastwards, to Malacca and Ceylon. It grows in all warm countries and often covers enormous areas. When entering cultivated land it may become a serious pest.

The roots are used as an emollient in Cambodia, mostly in the fumigation of piles.

The roots are much appreciated in China for their restorative, tonic, haemostatic and antifebrile properties.

The Sutos of South Africa use the root in making a medicine for chest colds in children, while the Zulus regard it as a specific for hiccough.

Australia: Blady-grass—; *Baluchi*: Drug—; *Bengal*: Ulu—; *Bhabar*: Shiro—; *Bombay*: Dhub—; *Burma*: Thek-kay nyen—; *Cambodia*: Sbeou—; *Canarese*: Sanna dabbai hullu—; *Cantonese*: Pak mau kan—; *Chinese*: Mao Tsao, Pai Mao Ken—; *Hausa*: Tofa, Toha—; *Hindi*: Dabh, Siru, Ulu—; *Hova*: Tenina, Tenona, Tsevoka—; *Indo-China*: An do bach mao, Co danh, Mao ken, Tranh—; *Iraq*: Halfah, Shismallah—; *Kolami*: Chero—; *Malay*: Alang alang, Lalang—; *Malaya*: Pak mau kan—; *Mundari*: Huringciru—; *North-Western Provinces*: Shiro—; *Punjab*: Siru, Ulu—; *Sakalave*: Manevica—; *Sanskrit*: Balbajamu, Barhissu, Darbha—; *Santali*: Chero—; *Simla*: Dab—; *Sinhalese*: Iluk—; *Southern Nigeria*: Spear Grass—; *Suto*: Mohlabalerumo, Mohlorumo—; *Tamil*: Dharbai pul, Tharpaipillu—; *Telugu*: Barumbiss, Dharba, Modavagaddi—; *Uganda*: Lusanke—; *Upper India*: Bharwai, Sil, Sir, Usirh—; *Zulu*: umThente—.

LOLIUM.

This genus includes 6 species, natives of Europe, temperate Asia, and North Africa; but naturalised in many countries.

Many of the species are reputed to possess a poisonous principle.

Lolium temulentum Linn. is an annual weed of cultivation, also occasionally met with as a wayside weed and in waste ground, common in the plains and hills of the Upper Gangetic Plain, the Punjab, the North-West Provinces ascending to 4,000-6,000 ft. in the Himalaya, and Sind. It extends throughout Europe and Western Asia, has been found in the island of Madura and in North Africa, and occurs as an introduced plant in the United States and Australia.

The seeds or grains were used medicinally by the ancient Greeks and Romans. The old sages, however, supposed it to cause blindness, and with the Romans, *lolo victitare*, to live on Darnel, was a phrase applied to a dim-sighted person. Gerard says, 'The new bread wherein Darnel is eaten hot, causeth drunkenness'. A general trembling, followed by inability to walk, hindered speech, and presently profound sleep with subsequent headache and vomiting, are the symptoms produced by Darnel when taken in a harmful quantity.

'As it is not without some vices', says Culpeper, 'so hath it also many virtues. The meal of Darnel is very good to stay gangrenes and other such like fretting and eating canker and putrid sores; it also cleanseth the skin of all leprosies, morphews, ringworms, and the like, if it be used with salt and raddish roots. And being used with quick brimstone and vinegar, it dissolveth knots and kernels, and breaketh those that are hard to be dissolved, being boiled in wine with pigeon's dung and linseed. A decoction thereof made with water and honey, and the places bathed therewith is profitable for the sciatica. Darnel meal applied in poultice draweth forth splinters and broken bones in the flesh. The red darnell boiled in red wine and taken, stayeth the lax and all other fluxes and women's bloody issues and restraineth urine that passeth away too suddenly.'

Darnel meal is still recommended as a sedative poultice, and is still believed to cure freckles.

Catalan: Juy, Sisanya—; *Devonshire*: Eaver, Iver—; *Dutch*: Bolderik, Dolik, Dravik—; *English*: Bearded Darnel, Cheat, Darnel, Jura, Ray Grass, Rye Grass, Wary, Bragge, Cockle, Dornel, Dragge, Drake, Drank, Dravick, Droke, Drunk, Drunken Plant, Eaver, Ivray, Jum, Lover's Steps, Ray, Riely, Rivery, Sturdy—; *French*: Ivraie, Ivraie annuelle—; *German*: Lolch, Taumelkorn—; *Hindi*: Machni—; *Iraq*: Hanaitah, Ruwaitah, Shailam—; *Italian*: Gioglio, Loglio—; *Maltese*: Sicrana—; *Portuguese*: Joio—; *Roumanian*: Neghina, Selbata, Zizanie—; *Russian*: Plevel, Pshenetz—; *Somersetshire*: Devon Ever—; *Spanish*: Joyo, Zizaña—; *Sussex*: Crop—; *Uruguay*: Joyo, Trigollo, Zizaña—.

LOPHATHERUM.

This genus consists of 2 species inhabiting Indo-Malaya, China and Japan.

Lophatherum gracile Brongn. is found in Tropical Himalaya from Sikkim eastwards, the Khasia and Naga Hills, and Ceylon up to 4,000 ft. It is common along forest paths in the whole Malay Peninsula from Singapore to Kedah, from the plains to 5,000 ft. altitude in the Thaiping Hills and Pahang. It extends to the waste land in China, Japan, Java, Amboyna and New Guinea.

In China the leaves are considered to have antifebrile and diuretic properties.

Annam: Co may, Dam chuc diep—; *Chinese*: Tan Chu—; *Malay*: Rumput jarang, Rumput Kelurat, Rumput ubi bulush—; *Sino-malay*: Tham chook—.

MANISURIS.

The one species of this genus, **M. granularis** Sw., is found throughout the hotter parts of India, from the Punjab eastwards to Burma, and southwards to Ceylon. It occurs in most tropical countries.

Anislie says that in Behar the plant is prescribed internally in conjunction with a little sweet oil, in cases of enlarged spleen and liver.

Ajmere: Kangni—; *Berar*: Ratop—; *Chanda*: Agimaligadi—; *Gujerat*: Kasium, Kasiunghas—; *Hindi*: Kangni, Trinpali—; *Naguri*: Buruburuludiatasad, Ludiatasad—; *Rajputana*: Dhaturoghas—; *Sanskrit*: Palanggini—; *Sierra Leone*: Ardande, Fesifesi, Guisqui—; *Udaipur*: Dhaturoghas—.

ORYZA.

This genus numbers about 17 tropical species extending to the subtropical regions of both hemispheres.

Oryza sativa Linn. is widely cultivated. It occurs indigenous in the marshes of Rajputana, Sikkim, Bengal, the Khasia Hills, Central India, the Circars and Pegu. It extends to Australia.

Ayurveda describes the rice grain as acrid, sweet, oleagenous, tonic, aphrodisiac, fattening, diuretic and useful in biliousness.

In India rice is used variously in sick diet. It is invariably ordered as the safest and best food in all dysenteric complaints. Boiled rice, when hot, is used as a poultice. Rice-water is recommended as an excellent demulcent, refrigerant drink in febrile and inflammatory diseases, dysuria and other affections requiring this class of remedies. This decoction is also given as an enema in affections of the bowels.

In Cambodia the husk of the grain is considered anti-dysenteric. The roasted grain, mixed with an equal amount of palm-sugar, is prescribed in *Strychnos* poisoning. Boiled in water and then dried in the sun, the grain enters into the composition of remedies for leprous ulcers.

Certain varieties of specially prepared grains are used medicinally in China and Malaya. Malted rice is used as a peptic, carminative and tonic.

In Europe the grain has long been considered to exercise pectoral virtues, and useful for persons troubled with lung disease, and spitting of blood, as in pulmonary consumption. 'The grain stays laxes and fluxes of the stomach and belly, especially if it be parched before it is used, and hot steel quenched in the milk wherein it is boiled, being somewhat drying and binding. The flour of the rice has the same property, and is put into cataplasms to repel humours from flowing to the place, and also to women's breasts to stay inflammations.'

Rice bread and rice cakes, simply made, are very light and easy of digestion. The gluten confers the property of rising, on dough or paste made of rice flour. But as an article of sustenance rice is not well suited for persons of fermentative tendencies during the digestion of their food, because its starch is liable to undergo this chemical change in the stomach.

The grain is officinal in Austria, Belgium, France, Germany, Great Britain, Holland, Italy, Portugal, Spain, Switzerland and Turkey.

Amblaw: Fala—; *Annam*: Lua nep, Lua nui, Lua song lon, Lua te, Lua toc—; *Arabic*: Arruz, Arz—; *Armenian*: Priusch—; *Belgaum*: Bhatta—; *Bengal*: Chal, Chanvol, Dhan, Oridhana—; *Bombay*: Bhatta, Dangar—; *Bouru*: Hala, Halai, Pala—; *Broach*: Dangar—; *Burma*: Chan, Saba, San—; *Cambodia*: Srau damnop, Srau khasai, Srau prapeai vea—; *Canarese*: Akki, Batta—; *Catalan*: Arros—; *Central Provinces*: Deaodhan—; *Ceram*: Fala—; *Chinese*: Ch'en Lien Mi, Hsien, Keng, Tao, Tao Tzeu—; *Cochin China*: Lua—; *Danish*: Riis—; *Deccan*: Chanval—; *Dutch*: Rijst—; *East Indies*: Paddy—; *Egypt*: Arus, Rus, Ruz—; *English*: Rice—; *Ewe*: Molung, Morli, Morlu—; *Fanti*: Omo—; *Fatehpur*: Phasai—; *French*: Riz—; *Ga*: Omong—;

Gambia: Mannow—; *German*: Reiss—; *Greek*: Oryza, Oryzion, Oryzon—; *Guam*: Fae, Fai, Faria—; *Gujerati*: Chokha—; *Hausa*: Shinkafa—; *Hazara*: Shali—; *Hindi*: Chaval, Deodhan, Dhan, Pusui—; *Hungarian*: Riskasa—; *Indo-China*: Khao, Nganh, Nhu—; *Iraq*: Shilib, Ruzz—; *Italian*: Riso—; *Japanese*: Ko, Kome, Motsj—; *Java*: Bai—; *Jhang*: Munji—; *Kashmir*: Dein, Tani—; *Khmer*: Srau, Srou, Srur—; *Kolami*: Baba, Birbaba—; *Konkani*: Bhat—; *Krepi*: Morli—; *Krobo*: Omong—; *Kurdish*: Chaltuk, Pishik—; *Laos*: Khao chao, Khao hai, Khao loi, Khao nieu—; *Madagascar*: Vary—; *Malay*: Pady—; *Malayalam*: Ari, Nellu—; *Marathi*: Bhat, Tandula—; *Matabello*: Feha—; *Mon*: Sro—; *Mount Abu*: Garri, Sal—; *Mundari*: Baba—; *Mysol*: Fas—; *Mysore*: Bhatta, Nellu—; *North-West Provinces*: Chanwal, Dhan, Jarhan, Lehi, Munji, Pusai—; *North Queensland*: Kineyah—; *Oudh*: Dhan, Pashai, Passari, Tinni—; *Palaung*: Rekao, Sakao, Takao—; *Pandran*: Kandahari, Khisumbhuz, Wilaiti—; *Partabgarh*: Sathi—; *Persian*: Biranj—; *Peshawar*: Shol—; *Philippines*: Bolahan, Palai—; *Polish*: Ryz—; *Portuguese*: Arroz—; *Punjab*: Dhan, Munji, Shalian, Tai—; *Rajputana*: Garri—; *Rampur*: Phasai—; *Roumanian*: Orez—; *Russian*: Psheno, Ris, Sarachinskoe psheno—; *Sanskrit*: Arunya, Ashuvrihi, Dhanya, Nivara, Shali, Tandula, Vrihi—; *Santal*: Uri, Urihoro—; *Sema*: Aghi—; *Shahrig*: Shali—; *Sind*: Chanwar, Sari, Sugdasi—; *Sinhalese*: Goyan, Hal, Uruwi—; *Spanish*: Arroz—; *Sunda*: Pare, Pari;— *Swedish*: Ris—; *Tagalog*: Bigas, Binambang, Bolohan, Dumali, Lamuyo, Malagguit, Palay, Quinanda, Tangi—; *Tamil*: Arishi, Arisi, Nellu—; *Tartary*: Dugu—; *Tayabas*: Nilomot—; *Telugu*: Biyam, Dhanyamu, Errajilama, Nevaridhanyamu, Ouri, Urlu, Vadlu, Vudlu—; *Tobu*: Shali—; *Turkish*: Pirinj, Pirins—; *Twi*: Aimong, Mong—; *Uriya*: Balunga, Chaul, Dhan, Dhanno, Rabana—; *Xong*: Ruko—; *Zehri*: Pirkalanari—.

OXYTENANTHERA.

This genus includes 16 species occurring in India, Burma, Malaya and Africa.

Oxytenanthera sinuata Gamble is found south of the Malay Peninsula in Johor, and Negri Sembilan; but nowhere very common.

The very fine hairs found on the sheath leaves of the young sprouts are prominent among Malay poisons. They are frequently used with pounded glass and set up a train of symptoms like that of a chronic pseudo-dysentery.

In Kelantan bamboo hairs are sometimes mixed with the juice obtained from *Caryota mitis* Lour. and an extract of toad. This toad extract is made from the common brown toad by allowing it to decompose in a bamboo cylinder containing a little water; after an interval of seven days this is smeared or sprinkled over wearing apparel, and the ingredients are said to set up an incurable and painful skin disease like a ringworm in appearance.

The hairs are mixed with the ground bark of *Wickstroemia ridleyi* Gamble and decayed copra, and then thrown into rivers to stupefy fishes.

Malay: Buloh minyak—.

PANICUM.

This genus is a heterogeneous assemblage of about 400 species, mostly natives of warm regions, a few being found in temperate climates of the northern hemisphere, one or two being almost cosmopolitan.

Many species are much valued as fodder-grasses but a few are said to be toxic to the animals.

I. Annuals.

a. Spikelets $\frac{1}{6}$-$\frac{1}{5}$ in. long. Stems tufted, 2-4 ft. long, stout. Leaves 6-12 in. long ... 1. *P. miliaceum.*

b. Spikelets $\frac{1}{10}$-$\frac{1}{8}$ in. long. Stem 1-3 ft. long, rather slender. Leaves 1-2 ft. long ... 2. *P. miliare.*

II. Perennials.

a. Spikelets $\frac{1}{10}$ in. long, laxly clustered on the branches; glume IV smooth. Leaves 6 by $\frac{1}{6}$ in. Panicle 6 in. high ... ... 3. *P. antidotale.*

b. Spikelets $\frac{1}{12}$-$\frac{1}{10}$ in. long, large, scattered; glume IV finely rugulose. Leaves 1-2 ft. by $\frac{1}{2}$-1 in. Panicle 1-2 ft. high ... 4. *P. maximum.*

c. Spikelets small, very numerous, crowded: glume IV smooth. Leaves 5-12 in. by $\frac{1}{4}$-$\frac{1}{2}$ in. Panicle 7-12 in. long ... ... 5. *P. sarmentosum.*

1. **Panicum miliaceum** Linn. is cultivated or naturalized throughout the hotter parts of India, Africa and other hot countries. It is grown in various parts of India, even up to 10,000 ft. on the Himalaya, but nowhere to any great extent.

Ayurveda writers describe the plant as sweet and acrid, causing biliousness and indigestion.

At Shoran, in Baluchistan, the plant is used as a cure for gonorrhoea.

Arabic: Dokhu, Worga, Worglo—; *Ashkobi*: Azhaum, China—; *Bagwana*: Peonprish—; *Bengal*: China—; *Bihar*: China, Chinh, Chinna—; *Bombay*: Bansi, Chenah, China, Chirwa, Phikar, Rali, Sama, Sawa, Vari, Varikaanu, Varisava, Wadi, Worga—; *Bundelkhand*: Bansi, Phikai, Rali—; *Canarese*: Baragu, Bilibaragu, Karibaragu, Save—; *Chinese*: Chi, Shu—; *Deccan*: Sava, Sawi, Shamakh, Wari—; *Dutch*: Gierst—; *Egypt*: Dokhn—; *English*: Broom Corn Millet, Chena Millet, Common Millet, Indian Millet—; *French*: Mil, Mil en branches, Mil commun, Mil d'Inde, Petit mil, Millet, Millet commun, Millet à grappes, Millet rond, Millet rouge—; *German*: Hirse—; *Gujerati*: Chino, Samli, Vari—; *Hindi*: Chena, China—; *Iraq*: Dukhn—; *Kashmir*: Chinwa—; *Kila Saifulla*: Azhdan—; *Ladak*: Tzede—; *Lepcha*: Mung-cher—; *Marathi*: Barag, Sava, Vari—; *North-Western Provinces*: Chehna, Chinwa, Chirwa, Kuri, Sawanchaitwa, Sawanjethwa—; *Persian*: Arzan—; *Portuguese*: Milho miudo—; *Punjab*: Anne, Chena, China, Chini, Salan, Salar—; *Quetta*: Gamh—; *Roumanian*: Malaiu, Meiu—; *Russian*: Proso—; *Sanskrit*: Anu, China, Chini, Rad, Varaka, Vrihibheda—; *Shoran*: Chabor—; *Sind*: Chinu—; *Sinhalese*: Mainairi—; *South Africa*: Indian Buffalo Grass—; *Tamil*: Kadaikanni, Katakanai, Samai, Varagu—; *Telugu*: Barigalu, Varagalu, Warigalu, Worga, Wuragi—; *Tobu*: Azhdun—; *Uriya*: Rala—; *Yemen*: Kossayb, Mileb—.

2. **Panicum miliare** Lam. is cultivated or naturalized throughout India and Ceylon. It is cultivated in the tropics.

According to some Ayurveda practitioners the plant acts as a nervine stimulant and tonic.

Bengal: Gondula—; *Bombay*: Badi, Bagad, Burburi, Kulti, Poi, Warai—; *Canarese*: Bilisamai hullu, Shamai—; *Central Provinces*: Chika—; *English*: Little Millet—; *Hasada*: Bicagurulu—; *Hindi*: Kungu, Kutki, Savan—; *Indo-China*: Co gang, Co ong—; *Khond*: Gundli, Pani kuhuri—; *Malayalam*: Shama—; *Mundari*: Arabende, Saramecadlongurulu—; *Naguri*: Hendegudulu—; *North-Western Provinces*: Kutki, Mighri—; *Punjab*: Kutki—; *Rajputana*: Nillashama—; *Ranchi*: Mota gundli—; *Santali*: Gundli—; *Sinhalese*: Meneri—;

Tamil: Chamai, Perusamai, Samai, Shamai—; *Telugu*: Chamalu, Gangasamalu, Nallachamalu, Nellashama, Nellashamalu, Sani, Savai—; *Uriya*: Luniva—.

3. **Panicum antidotale** Retz. grows abundantly in the Punjab, the Upper Gangetic Plain, the Western Peninsula and Ceylon. It extends to Afghanistan, Africa and Australia.

The smoke of the burning plant is used for fumigating wounds, also as a disinfectant in small-pox.

In Madras it is given for throat affections.

A report from Hissar states that this grass is grazed only when green, as it afterwards becomes bitter or saltish, and poisonous to cattle.

Baluchi: Bershonk, Gomaz, Gumazg—; *Bombay*: Barigagli, Barn, Barwari, Ghamar, Gharam, Girni, Git, Male, Mangrur, Sera, Shamukha—; *Gujerat*: Dun, Dusghas, Dusto—; *Hindi*: Ghemor, Gunara, Jamur—; *Kulanch*: Gomaz—; *Mand*: Dariagi—; *North-Western Provinces*: Gamur, Ghamor—; *Punjab*: Baru, Garm, Ghamrur, Ghamur, Gharam, Ghirri, Girui, Mangrur—; *Pushtu*: Male, Shamukha—; *Rajputana*: Bangagli, Banvari, Gramna—; *Sadani*: Bende—; *Santali*: Layogundli—; *Shahrig*: Gunj—; *Sibi*: Gam—; *Sinhalese*: Krimisastru—; *Tamil*: Nassiampillu, Pinisupillu—.

4. **Panicum maximum** Jacq. is a native of Africa, cultivated in many parts of India. It occurs throughout South Africa, the Mascarene Islands, Madagascar and in Yemen. It has been introduced and is widely spread in America.

This grass is considered one of the best horse-fodders, but it may cause fatal colic if given in too large a quantity or when wet.

It is said to be responsible in South Africa for the production of 'dikoor', a disease which affects young sheep, four to twelve months old, which are running on old lands.

Ala: Ikbo mili—; *Brazil*: Capim de Angola, Capim de Colonia—; *Burmese*: Nau-Ka-thau-hau—; *Canarese*: Gini hullu—; *English*: Guinea Grass—; *Ewe*: Kogbe—; *Fanti*: Nykekyer—; *Ga*: Nto—; *Hindi*: Gini ghaus—; *Orange Free State*: Blousaad—; *Seychelles*: Fataque—; *Sinhalese*: Ratatana—; *Southern Nigeria*: Ikbo mili—; *Tamil*: Giniopillu—; *Transvaal*: Buffelgras—.

5. **Panicum sarmentosum** Roxb. is found in Assam, Sylhet, Cachar, and the Khasia Hills, ascending to 5,000 ft., Chittagong, and Burma. It is very abundant in the Malay Peninsula in thickets and open edges of woods, often forming great masses scrambling over bushes and ascending to tree-tops. It extends to the Malay islands, Tongking, and China.

In Malaya the roots are chewed with betel nuts as an aphrodisiac.

Malay: Rumput jangut ali, Rumput kulubong—.

PASPALUM.

This is a plymorphic genus including over 200 species, scattered through the tropics of both hemispheres, but most abundant in America.

I. Spikelets oblong or lanceolate acute or acuminate.
    Margin of rachis minutely toothed ... 1. *P. sanguinale*.

II. Spikelets orbicular or broadly oblong.
    a. Spikelets ciliate from the margins of the upper glume ... ... 2. *P. conjugatum*.
    b. Spikelets not ciliate ... ... 3. *P. scrobiculatum*.

1. **Paspalum sanguinale** Lam. is found throughout India, in moist and dry situations, ascending the Himalaya to 6,000 feet. It is cultivated in the Khasia Hills. This grass is one of the commonest weeds in all tropical and warm countries, becoming less frequent in Central Europe.

The plant is known to yield hydrocyanic acid.

Berar: Chikhari—; *Central Provinces*: Korkoljodi—; *Egypt*: 'Iraq-en-Najil, Tayyin—; *Hindi*: Takri, Takria—; *Khasi*: U'rai-shan—; *North-Western Provinces*: Charamara, Kewai—; *Punjab*: Baratakria, Dubra, Farw, Motikhabbal, Takkri—; *Rajputana*: Hen—; *Suto*: Mmoyane—; *Trans-Indus*: Khurash—; *United States*: Brab Grass—.

2. **Paspalum conjugatum** Berg. is common in the hotter parts of America from the Gulf States southwards; also in the Indo-Malayan region, Lower and Upper Guinea, and Polynesia.

In some places of the Gold Coast the grass is boiled and used in the bath to cure faintness.

Ashanti: Nsuorhwea—; *Hawaii*: Hilo Grass—; *Jamaica*: Sour Grass—; *Malay*: Rumput kerbau—; *Malaya*: Buffalo Grass—; *Montserrat*: Crab Grass—; *Sierra Leone*: Yane, Yani—; *Singapore*: Green Grass—; *Twi*: Nsorhwea—; *West Indies*: Sour Grass—.

3. **Paspalum scrobiculatum** Linn. is found wild or cultivated throughout the hotter parts of India, from the Punjab eastwards and southwards to Singapore and Ceylon. It is distributed through the Tropics of the Old World.

Ayurveda writers describe the plant as sweetish and bitter, tonic, and antidotal to poisons, useful in the treatment of ulcers; it causes constipation and flatulence, upsets the physiological balance of the body, and leads to hallucinations and dysuria.

Mohammedan authors consider it styptic, useful in inflammation and in diseases of the liver, liable to cause constipation and temperature.

Though used as food by a very large number of people in India, the grain is decidedly a narcotic poison, and its deleterious effects are well known in the various parts of the country where this crop is grown. The symptoms of poisoning resemble those caused by datura, and are more severe in cattle than in man, due no doubt to the animals eating the grain and husk, and also to the absence of vomiting, an effect which almost always takes place in man.

Sushruta prescribes the plant in combination with other drugs for the treatment of scorpion sting, but Caius and Mhaskar have shown experimentally that this grass is not an antidote to scorpion venom.

Australia: Ditch Millet, Hureek—; *Bengal*: Khodoadhan, Kodoadhan—; *Bihar*: Koda, Kodai—; *Bombay*: Harik, Kodra, Kodri, Kodro, Kodroakora, Pakod, Pakodi—; *Canarese*: Arikel, Haraka hullu, Harik—; *Central Provinces*: Kodie, Kodo—; *Ceylon*: Koda Millet—; *Gujerati*: Kodra, Kodro, Meya—; *Hausa*: Tumbijaki, Tumbin jaki—; *Hindi*: Koda, Kodaka, Kodava, Kodon—; *Kolami*: Garakode—; *Konkani*: Pacodd, Pacoll—; *Kumaon*: Kodo, Kodra, Kodram—; *Marathi*: Harik, Kodra, Kodru—; *Mundari*: Birjane, Loeongjane, Pirijane, Tasadjane—; *North-West Provinces*: Koda, Kodon, Kodram—; *Porebunder*: Kodo—; *Punjab*: Kodon, Kodra—; *Sanskrit*: Koddara, Kodrava, Koradusha, Kordrava, Kuddala, Madanagraka, Uddala, Vanakodrava—; *Santali*: Janhe—; *Sinhalese*: Amu, Karalamu, Walamu—; *Southern Nigeria*:

Ikbonta—; *Tagalog*: Paragis, Sabungsabungan—; *Tamil*: Karuvaragu, Varagu, Varaku—; *Telugu*: Allu, Alu, Arikalu, Arike, Arikelu, Aruga, Kiraruga, Nita arigaddi, Pataarige—; *Urdu*: Kodon—; *Uriya*: Khoddi, Kodus—; *Zulu*: isAmuyisane—.

PENNISETUM.

This genus numbers about 40 species which are found in most warm countries, particularly in dry regions.

Annual	1. *P. spicatum.*
Perennial	2. *P. compressum.*

1. **Pennisetum spicatum** Roem. & Schult. (=*P. typhoideum* Rich.) is cultivated in numerous forms in India, northern and tropical Africa, and southern Europe.

Ayurvedists consider the plant heating, aphrodisiac in women, and tonic; it is useful in diseases of the heart; it improves the appetite for food and the relish of it, but it causes flatulence.

In Guinea the root is reputed toxic to man and animals.

In South Africa the Sutos use the plant as a medicine for cows which have been incompletely delivered at parturition.

Arabic: Dookhr, Duku—; *Ashanti*: Ewio—; *Bihar*: Gahuma, Jondhariya—; *Bombay*: Bajera, Bajra, Bajri—; *Canarese*: Sajje—; *Egypt*: Dok, Hema, Gusab—; *English*: Bulrush Millet, Cumboo Millet, Pearl Millet, Spiked Millet—; *Eritrea*: Bultuc—; *Ewe*: Gbekul, Lu—; *Ga*: Ngma—; *Gambia*: Sannio—; *Hausa*: Damro, Dauro, Gero, Maiwa—; *Hindi*: Bajera, Bajra, Bajri, Kasajonar, Lahra—; *Kolami*: Tuti—; *Krobo*: Ngma—; *Kumaon*: Bajra—; *Malayalam*: Kampam, Mattari—; *Mandingo*: Sannio—; *Matabele*: Um-velli-velli—; *Msutu*: Leeuja—; *North-Western Provinces*: Bajra, Bajra tangunanwa, Bajri, Lahra—; *Nupe*: Gero—; *Punjab*: Bajra, Bajza—; *Rajputana*: Bajra—; *Sanskrit*: Agradhanya, Nali, Nalika, Nilakana, Nilasasya, Sajaka, Varjari, Varjarika—; *Santali*: Lendha—; *Sesuto*: Nyalothie—; *Shahrig*: Bajari—; *Sind*: Bajaro—; *Sudan*: Dukhu—; *Tamil*: Kambu—; *Telugu*: Gantelu, Peddaganti, Sajja, Sajjalu, Sazza—; *Transvaal*: Leeuja—; *Tripoli*: Shessab—; *Uriya*: Bajramula, Gantiva—; *Zambesi*: Mishuera—; *Zanzibar*: Mawali—; *Zulu*: Amabile, Nyaloti, Nyawoti—.

2. **Pennisetum compressum** R. Br. (=*P. japonicum* Trin.) is found in Burma, Taong Dong, the Sham Hills up to 4,000 ft. It extends to China, Japan, Tongking and Australia.

This grass is used as a tonic in China.

Chinese: Lang Wei Ts'ao.

PHALARIS.

This genus consists of 10 species, natives of the Mediterranean region, but widely dispersed as weeds; one species occurs in the boreal region and in South Africa, and another is found from California to Chile.

Phalaris arundinacea Linn. is found in Kashmir by the Wolar Lake at an altitude of 5,550 ft. It is fairly common along the pond edges and stream banks, and in wet places in Eastern Washington, but is infrequent in California. It extends to the northern temperate and Arctic regions.

This grass is reported poisonous.

English: Gardeners' Garters—; *Pacific Coast*: Daggers, Reed Canary-grass, Ribbon-grass—.

PHRAGMITES.

This genus includes 2 species, one cosmopolitan, and one in Argentine.

Phragmites maxima Blatter & McCann (=*P. communis* Trin. =*P. roxburghii* Steud. =*P. karka* Trin.) is cosmopolitan.

Ayurvedists describe the plant as sweet and acrid, cooling, aphrodisiac; useful in biliousness, urinary troubles, vaginal and uterine complaints, erysipelas, and diseases of the heart.

The root is regarded as cooling and diuretic by the Chinese. It is considered diuretic and sudorific in Spain.

The plant is said to be rich in sugar. A manna, known as California Manna or Father Picolo's Manna, is mentioned as being deposited on the plants growing in California and collected by the Indians. It is believed that the manna is a saccharine deposit caused by aphides.

Arabic: Bus—; *Bengal*: Nal—; *Bihar*: Narkat—; *Burma*: Kaing—; *Canarese*: Hulugalagu, Hulugilahullu, Hulugilu—; *Catalan*: Canya borda, Canya de escombretas, Canyis, Canyisos—; *Chinese*: Lu—; *Egypt*: Buz haggny, Buz hagney, Ghab, Ghabrihy, Haggn—; *English*: Nodding Reed—; *French*: Cannette, Petit roseau, Roseau à balai, Roseau aquatique, Roseau des marais—; *Garhwal*: Bichhra—; *Gujerati*: Nairi, Nali—; *Hausa*: Machara, Wachiar giwa, Wutsiyar giwa—; *Hindi*: Nainarakula, Nal, Narkul, Nulanara—; *Hova*: Barorata, Katsaoka, Volotara—; *Indo-China*: Kiem, Lo can, Sai, Say—; *Iraq*: Qasab—; *Irish*: Giolcach—; *Italian*: Canela de Ema, Canna palustre, Cannuccia—; *Katagum*: Machara, Wachiar giwa, Wutsiyar giwa—; *Kolami*: Jankai—; *Kumaon*: Karka, Khaila, Khailuwa, Nal—; *Lagos*: Ifu—; *Languedoc*: Rouza, Rouzo—; *Loralai*: Nal, Nar—; *Libya*: Buzzam—; *Malay*: Gudabong—; *Malayalam*: Nadam, Nalam, Nannana, Naval—; *Malta*: Common Reed, Spire Reed, Canna di palude, Canna da spazzole, Kasbiet irrih—; *Marathi*: Deonala, Nala—; *Mexico*: Carrizo—; *Pacific Coast*: Common Reed—; *Punjab*: Bagnarri, Dila, Nai, Nal, Nar, Nara, Naria—; *Pushtu*: Drumbi, Dwarena, Ghwarga—; *Roumanian*: Rogoz—; *Sanskrit*: Dhhamana, Nada, Nala, Potagala, Shunyamadhya—; *Shahrig*: Nal—; *Sokoto*: Gabara—; *Spanish*: Cañeta, Garrizo—; *Tagalog*: Tambo—; *Tamil*: Perunanal—; *Telugu*: Kikkasagaddi, Mettantisa, Nagasvaramu, Peddarellu, Puvvuguttigaddi—; *Turkish*: Gamish—; *Uniyoro*: Mataetae—; *Uriya*: Nolo—; *Zhob*: Nal—.

PHYLLOSTACHYS.

This genus consists of about 20 Eastern Asiatic species.

Phyllostachys bambusoides Sieb. & Zucc. is found in Upper Assam on the Mishmi Hills. It inhabits China and Japan.

The plant is much used medicinally in China, where the root is considered tonic and the sprouts parasiticidal. The silicious concretion or *tabashir*, is a demulcent, tonic, aphrodisiac and pectoral, commonly administered in cough, asthma, consumption and fever.

Chinese: Chu, Chu Huang, Chu Sun, Hsien Jen Chang, Kuei Ch'ih, Suan Sun—; *Indo-China*: Son truc, Truc—.

POLYTOCA.

This genus consists of 8 species spread over tropical Asia and Australia.

Polytoca barbata Stapf. is found in the hot and damp parts of India, from the Punjab to Assam and Munnepore, and southwards to Ceylon, extending to Java.

According to Ayurveda the plant is bitter and sweet, tonic, laxative and aphrodisiac. It is reputed useful in strangury, burning sensations, phthisis, vesical calculi, biliousness, diseases of the blood and tendency to haemorrhage.

Balghat: Kadpi—; *Bengal*: Gurgur, Keshaghansa—; *Canarese*: Kajalu—; *Central Provinces*: Kadpi—; *Chanda*: Kirmagilaramgadi—; *Gond*: Karpia—; *Guejrati*: Kansado—; *Hindi*: Kansa—; *Konkan*: Kasada—; *Marathi*: Kasai, Varival—; *Sanskrit*: Amarapushpaka, Ashvabala, Chamarapusha, Darbhapatraka, Ikshugandha, Ikshura, Ishika, Kanda, Karmamula, Kasekshu, Kasha, Nadeya, Niraja, Potagala, Sharada, Shiri, Sukanda, Vanahasaka—; *Telugu*: Ghellagadi—; *Uriya*: Phultainr—.

SACCHARUM.

This genus includes 8 tropical and subtropical species.

I. Hairs on callus much exceeding the spikelet. Glumes I and II not dorsally villous.
   a. Culms not leafy above, under .7 in. diameter. Leaves under .8 in. width. Glumes I and II ciliate ... ... 1. *S. spontaneum.*
   b. Culms densely leafy above, over 1 in. diameter. Leaves over 1 in. width. Glumes I and II glabrous ... ... 2. *S. officinarum.*

II. Hairs on callus of sessile spikelet shorter or not much longer than the spikelet. Glumes I and II often dorsally villous. Nodes of culm not bearded. Sheaths not hirsute. Glumes I and II dorsally villous.
   a. Foliage not glaucous. Culms densely leafy above. Sessile spikelet shorter than internodes ... ... 3. *S. arundinaceum.*
   b. Foliage glaucous. Culms not leafy above. Sessile spikelet longer than internode of rachis ... ... 4. *S. munja.*

1. **Saccharum spontaneum** Linn. is found throughout the warmer parts of India and Ceylon, ascending to 6,000 ft. in the Himalaya. It is distributed from the south of Europe to the warm regions of the Old World, and extends to East Australia.

Ayurveda practitioners commonly use this grass as a substitute for *Polytoca barbata* Stapf. Sanskrit authors credit the two plants with the same medicinal properties.

Bombay: Bochri, Dharbi, Dhub, Kan—; *Bengal*: Kagara, Kans, Kas, Kash, Kashiya, Khagra, Khansi—; *Burma*: Thekkaygyee, Thetkiakyn—; *Canarese*: Darbhe, Hodakehullu, Mutullahullu—; *Central Provinces*: Kans, Khan, Padar—; *English*: Thatch Grass, Wild Sugar Cane—; *Gujerat*: Kans, Kansado, Kansadoghas—; *Hasada*: Karetasad, Karitasad—; *Hausa*: Abokin, Kyamo, Kyamo kibiya, Kyamro, Kyauro, Kyauro kibiya, Sheme, Sansari—; *Hindi*: Kagara, Kans, Kas, Khansi, Khugura, Kosa, Kus—; *Kolami*: Puyal—; *Kumaon*: Jasha, Jhaush, Kash—; *Lao*: Pong—; *Lepcha*: Brung—; *Malayalam*: Nannana—; *Marathi*: Kagara, Kas—; *Mundari*: Kariba—; *Naguri*: Kasitasad—; *North-Western Provinces*: Kans, Kansa, Kansi—; *Oudh*: Khagar, Rara—; *Punjab*: Kahi, Kanh, Kans, Sarkara—; *Rajputana*: Kans, Kash, Kashi—; *Sadani*: Kasighas—; *Sanskrit*: Ikshugandha, Kasa, Kahsa, Khaggara—; *Sind*: Kahu, Khan, Khau—; *Tamil*: Achabaram, Anjani, Eruvai, Kosangam, Kucham, Kumil, Kurbagam, Nanal, Nanarbul, Nanmugappul, Peykkarumbu, Sangabidam, Saravanam, Sarupparasi, Sasabaram, Sugattan, Suvedasaram, Tittiru, Tittiruchi, Tuttam, Vedasam—; *Telugu*: Billugaddi, Kakicheraku, Kakiveduru, Koregadi, Rasalamu, Rellugaddi, Vetticharaku—; *Uriya*: Chhataiagaso, Inkoro, Kaso, Khhodi, Pothhorokhhodi—.

2. **Saccharum officinarum** Linn., probably a native of South Asia, is grown everywhere in India.

Ayurveda describes the sugar cane as sweet, oleagenous, diuretic, tonic, cooling and aphrodisiac. It recommends it as a useful remedy in fatigue, thirst, intestinal troubles, anaemia, erysipelas and leprosy. The cane, however, is indigestible, and likely to interfere with the heat factor in the body causing inflammations and ulcers.

Yunani describes the cane as sweet, laxative, diuretic, fattening and aphrodisiac. It considers it useful to purify the blood, good for the lungs, but bad for the liver.

The roots are used as a cooling and diuretic medicine; and the stem is said to be useful as a remedy for cough.

Sugar cane enters into the composition of Cambodian medicines used for the treatment of ulcers of the skin and mucous membranes. A decoction of the stem is given in diarrhoeas of childhood.

The sugar cane is recognised in Portugal, Spain, Switzerland and the United States as the officinal source of sucrose or saccharose.

The Hindus set a great value upon sugar, and in medicine it is considered by them as nutritious, pectoral and anthelmintic.

In Arabian works on Materia Medica, sugar is described as detergent and emollient. Many writers speak of it as attenuant and pectoral. It has also been supposed to have virtues in calculus complaints.

In the Punjab sugar is considered heavy, tonic and aperient, useful in heat delirium and disorders of the bile and wind.

In cases of poisoning by copper, arsenic, or corrosive sublimate, sugar has been successfully employed as an antidote; and white sugar finely pulverised is occasionally sprinkled upon ulcers with unhealthy granulation.

The root, the bark, the stem and the leaf, treacle and sugar, have all been boomed as snake-bite remedies. Mhaskar and Caius have, however, shown experimentally that, whether administered internally or applied externally, every part of the sugar cane is useless in the treatment of snake-bite.

Ada: Afunu—; *Annam*: Mia—; *Arabic*: Kasabishakar, Kasibshakar, Qasabussakar—; *Awina*: Fofongu—; *Behar*: Katari, Ketari, Khusiyar, Ukh, Ukh, Ukhi—; *Bengal*: Ak, Ganna, Ik, Kajuli, Kulluar, Kushiar, Puri, Uk, Ukyo—; *Bombay*: Ganderi, Gol, Serdi, Us—; *Brazil*: Canna, Canna de assucar, Tacomaree, Viba—; *Burma*: Keyan, Kyan—; *Cagayan*: Agbo—; *Cambodia*: Ampeou, Ampou—; *Canarese*: Ikshu, Ikshudanda, Ingolu, Kabbu, Kantara, Kantaraka, Madhura, Marakabbu, Pundra, Rasadali, Rasala, Rastale, Tanigarbu, Trinaraja—; *Catalan*: Cana dolsa, Cana de sucra—; *Ceylon*: Karambu—; *Chinese*: Kan Che, Sha T'ang, Shih Mi—; *Cochin China*: Mia—; *Deccan*: Ganda, Us—; *Dutch*: Suiker riet—; *Easter Island*: To—; *Egypt*: Ghah, Qassab sukkar—; *English*: Sugar Cane—; *Ewe*: Fofongu, Bogleng—; *Fanti*: Ahwerenkakraba—; *Fiji*: Dovu, Vico—; *French*: Canamelle, Cannamelle, Canne de Batavia, Canne de la Chine, Canne d'Haïti, Canne à sucre, Roseau à sucre—; *French Guiana*: Canne à sucre—; *Ga*: Sheng—; *German*: Zuckerrohr—; *Guam*: Tupo, Tupu—; *Gujerati*: Naisakar, Serdi, Sheradi, Sherdi, Uns—; *Gulf States*: Ribbon Cane, Sugar Cane—; *Hausa*: Deke, Karansariki, Rake—; *Hindi*: Ganna, Ikh, Kajuli, Khulua, Kumad, Naishakar, Rikhu, Uk, Ukh—; *Hova*: Fary—; *Iraq*: Qasab sukkari—; *Japanese*: Kansia—; *Java*: Tebu—; *Kano*: Rake—; *Konkani*: Uny, Uss—; *Krepi*: Bogleng, Boglengbiei, Boglengfe, Boglengyibor—; *Korbo*: Ahleu—; *Kumaon*: Rikhu—; *Kurdish*: Gamish-i-shikir—; *La Reunion*: Canne—; *Madagascar*: Fary—; *Malay*: Tebu, Tibu mira, Tubu—; *Malayalam*: Darbheshu, Ikshu, Kantarakam, Karimpu, Madhutrinam, Vellakarimpu—; *Marathi*: Aos, Kabbo, Us, Usa—; *Mundari*: Gurdanda, Gurkatauri, Gurkosear—; *Nepal*: Akali, Chaku, Uk—; *Newar*: Tu—; *New Caledonia*: Ariva, Arolam, Boiepe, Boinlioua, Delenole, Dilou, Dogangueni, Gadenadeboui, Goreate, Jate, Kabopolenouen, Kiaboue, Kinemaite, Kondimoua, Koubala, Maiou, Mebouangue, Mengou, Migao, Moene, Moindiene, Moueouete, Ngala, Niemba, Ouali, Ouane, Oudiepe-ait, Ouen, Ouen ebail, Ouen mangia, Ouen ou poudendate, Paiambou, Paieme, Pidiak, Pobone, Poilote, Schimate, Sthiabanghi, Tangalite, Thsiogan, Tilibi, Tshiambo—; *North-West Provinces*: Ganna, Ikh, Ikhari, Kanthirikhu, Punarikhu, Rikhu, Ukh, Ukhari—; *Parbuttiah*: Ghenra—; *Persian*: Naishakar—; *Philippines*: Tubo—; *Portuguese*: Canna de assucar, Canna doce—; *Punjab*: Canna, Ikh, Kamad, Kamand, Khand, Paunda, Shakarsurkh—; *Roumanian*: Trestie de zahar—; *Russian*: Saharnyi trastnik—; *Sakalave*: Fisika—; *Samoa*: Tolo—; *Sanskrit*: Adhipatra, Asipatra, Bhurirassa, Dirghachhada, Gandidi, Gudada, Gudadaru, Gudakashtha, Gudamula, Gudatrina, Ikshu, Ikshura, Kantara, Kantaraka, Karkotaka, Khadgapatraka, Koshakara, Madhutrina, Madhuyashit, Maharasa, Mrityupushpa, Payodhara, Pundraka, Rasala, Rasalu, Sastra, Sukumasaka, Trinadhiya, Vansha, Vipularasa, Vrishya—; *Santali*: Akh, Ikhshu—; *Sind*: Kamand—; *Sinhalese*: Uk, Ukgas—; *Sokoto*: Arakke—; *Spanish*: Caña de azucar, Caña dulce, Cañamiel—; *Tagalog*: Tubo—; *Tahiti*: To—; *Tamil*: Angarigai, Asibattiragam, Ikku, Kalai, Kannal, Karumbu, Madudirunam, Paruvayoni, Pundaram, Ukkiragandam, Ukkiragandi, Velam, Vengarumbu—; *Telugu*: Arukanupulakranuga, Cheraku, Cherakubhedamu, Cherakubodi, Cherakudubu, Ikshupu, Inju, Kantaramu, Kanupulacheraku, Lavucheraku, Pottikamucheraku, Tellacheraku, Tiyyamranu, Tunta, Vamsukamu—; *Tongking*: Mia, Mia co ke, Mia lau, Mia ly—; *Tulu*: Karumbu—; *Twi*: Ahwereu—; *Urdu*: Cana—; *Uriya*: Aku, Gudodaru, Ikhyu—; *Visayan*: Quilaba—; *Yemen*: Muddardjend—.

3. **Saccharum arundinaceum** Retz. is found throughout the plains and low hills of India, extending into China.

The root is demulcent and diuretic.

Bengal: Teng—; *Burma*: Phoungga—; *Canarese*: Abbe, Baragu, Hodakai hullu, Lekhinihullu, Munja, Munji, Nala, Rellu, Sara—; *Ceylon*: Elephant Grass—; *English*: Devil Sugar Cane, Reedy Sugar Cane, Wild Sugar Cane—; *Malaya*: Elephant Grass, Tebrau—; *Malayalam*: Mekhalapullu, Munja, Sarappullu—; *Punjab*: Sarkanda—; *Rajputana*: Sarpat—; *Sanskrit*: Gundra, Munja, Sara, Tejanaka—; *Sinhalese*: Rambuk—; *Tamil*: Elhudugirananal, Munji, Pi karumbu—; *Telugu*: Adavicheruku, Bramhamekhalamu, Gundra, Kondakanamu, Munjagaddi, Mungamu, Nadamu, Polagaddi, Ponika, Ponugu, Saramu—; *Uriya*: Kantosoro, Soro—.

4. **Saccharum munja** Roxb. (= *S. ciliare* Anders.) is abundant over the greater part of North-West India, especially in the Punjab, extending to the Upper Gangetic Plain.

Ayurveda describes the stem as sweet and acrid, cooling, and aphrodisiac; useful in thirst, burning sensations, erysipelas, diseases of the blood, urinary complaints, and eye troubles.

In the Punjab the root is burnt near women after delivery, its smoke being considered beneficial. The root is also used as a fumigant for burns and scalds.

Ajmere: Sara, Sarpat—; *Bengal*: Mucha, Ramshara, Sar, Sara, Sarpata, Shar—; *Bolan River*: Kash—; *Bombay*: Kerpa, Munj, Sar—; *English*: Munj

Grass—; *Hasada*: Mail—; *Hindi*: Munj, Munja, Ramsar, Sara, Sarkanda, Sarkara, Sarpat, Sarpatta—; *Marathi*: Mole—; *Mundari*: Hatumail—; *Naguri*: Mahil—; *North-West Provinces*: Ikar, Patawar, Sarhar, Sarkanda—; *Oudh*: Palwa—; *Pishin*: Surghashae—; *Punjab*: Kanda, Kharkana, Sarjbar, Sarkara—; *Quetta*: Surghashae—; *Sanskrit*: Bahupraja, Bana, Bhadramunja, Brahmanya, Chakshuveshtana, Darbhavhaya, Dridhatrina, Durmula, Ikshukanda, Maunji, Munja, Munjanaka, Munjata, Ranjana, Shakrabhanga, Shara, Shiri, Sthuladarbha, Sumekhala, Tejana, Tejanavhaya, Trinakhya, Vaniraka—; *Santali*: Sar—; *Telugu*: Gundra, Ponika—; *Tharu*: Kandikhar, Karai—; *Trans-Indus*: Darga, Karre—; *Turbat*: Dil—.

SETARIA.

This genus numbers about 100 species, found in tropical and warm temperate regions.

S. italica Beauv. and *S. viridis* Beauv. are used medicinally in China; *S. plicata* T. Cooke in La Reunion; *S. sulcata* Raddi in Zululand.

I. Leaves more or less plicate. Perennial. Culm reaching 5 ft. ... ... 1. *S. plicata.*

II. Leaves flat, not plicate.
  a. Culm 2-5 ft. high ... ... 2. *S. italica.*
  b. Stem 1-2 ft. high ... ... 3. *S. viridis.*

1. **Setaria plicata** T. Cooke is found throughout the moister hilly parts of India, from Kumaon in the Himalaya eastwards, ascending to 5,000 ft. in Sikkim, the Shan Hills in Burma, the Nilgiris up to 6,000 ft., the Malay Peninsula, and Ceylon. It extends to the Malay Islands and China.

The plant is used in La Reunion as an emollient diuretic.

La Reunion: Trainasse—; *Malay*: Akar pimpan—.

2. **Setaria italica** Beauv. is cultivated throughout India, and up to 6,000 ft. in the Himalaya. It is found in most warm, temperate and tropical countries.

According to Ayurvedic texts the plant is sweet and acrid, fattening, aphrodisiac, and sedative to the gravid uterus. It is useful in dispelling burning sensations, and in healing fractures. It produces flatulence.

It is a popular domestic remedy for alleviating rheumatic pains and the pains of parturition.

The grain is said to act as a diuretic and astringent, and to be of use externally in rheumatism.

When taken as the sole food Indian Millet is sometimes apt to produce diarrhoea. It has long been regarded as unsatisfactory for horses unless fed sparingly.

Andamans: Tanahal—; *Arabic*: Dukhn—; *Bengal*: Bertia, Chena, Kakni, Kakun, Kangni, Kangu, Kauni, Kirakang, Kirang, Kora, Rala, Rawla, Tangan—; *Bombay*: Kakun, Kang, Kangni, Korakang, Korakangu, Vavani—; *Bonai*: Kango—; *Bundelkhand*: Kakun—; *Burma*: Puki, Pyounglaykouk, Zami—; *Canarese*: Karibiragu, Naoni, Navanai, Navani, Vavani—; *Catalan*: Cúa de guilla, Cúa de guinea, Panis, Panissa—; *Cebu*: Mijo—; *Central Provinces*: Kungni, Rala—; *Chinese*: Liang, Shu, Su—; *Cochin China*: Cay khe—; *Deccan*: Bertia, Chena, Kakni, Kakun, Kangni, Kangu, Kauni, Kirakang, Kiranj, Kora, Rala, Rawla, Tangan—; *English*: Boer Manna, Foxtail Millet, Hungarian Grass, Italian Millet, Millet—; *French*: Mil à épi, Mil d'Italie, Millet en épi, Millet des oiseaux, Panis d'Italie, Panouil, Panouque, Penille—; *Gujerati*: Kang, Karang—; *Hindi*: Bertia, Chena, Kakni, Kakun, Kalakangni, Kanghuni, Kangni, Kangu, Kauni, Kirakang, Kiranj, Koni, Kora, Rala, Rawla, Tangan—; *Ilocano*: Bicacao, Bucacao—; *Iraq*: Dukhn—; *Italian*: Panico—; *Kashmir*: Pingi, Shali—; *Khasi*: U'rai-shoh—; *Kolami*: Haraba, Marang Kukru—; *Khondmals*: Arga—; *Konkani*: Kangu—; *Kumaon*: China, Gandra, Kangni, Koni, Mandira, Mandua, Murhoa, Shungura—; *Lynngam*: Jrai—; *Malay*: Iskoi—; *Malayalam*: Navana, Tauna, Tena—; *Malta*: Italian Millet, Panico—; *Marathi*: Chenna, Kang, Kangu, Rala, Rale—; *Mundari*: Irba—; *North-Western Provinces*: Kangni, Tangun—; *Pampangan*: Borona—; *Persian*: Arzun, Gal—; *Punjab*: Chanwalkangni, Chiurr, Gal, Husketkangni, Kangni, Khauni, Kher, Kusht, Shak, Shali—; *Pushtu*: Gal—; *Sanskrit*: Chinaka, Kangu, Kanguni, Kangunika, Pitatandula, Priyangu—; *Santali*: Erba—; *Sema*: Asüh—; *Sind*: Kirang—; *Sinhalese*: Tanahal—; *Spanish*: Mijo menor, Panizo—; *Tagalog*: Daua, Dava—; *Tamil*: Tenai, Tennai—; *Telugu*: Kora, Koralu—; *Uriya*: Kangu, Tangun—; *Visayan*: Daoa, Daua, Dava—.

3. **Setaria viridis** Beauv. is found in temperate Himalaya and Western Tibet, ascending to 11,000 ft.; but it is in no way common anywhere. It is also rare on the plains of India. It has been reported from the Nilgiri Hills. It is distributed throughout the temperate and subtropical regions of the Old World.

The plant, crushed and mixed with water, is used in China as an external application for bruises.

Chinese: Kou Wei Ts'ao—.

SORGHUM.

This genus consists of about 35 species spontaneous in the tropical and subtropical regions of both hemispheres, very few extending into the temperate zone. One group of forms is widely cultivated in the tropics, particularly in Africa and India.

A form of *S. guineense* Stapf. is grown for medicine in Upper Guinea; its grain is said to give colic to animals.

Perennial ... ... 1. *S. halepense.*
Annual ... ... 2. *S. vulgare.*

1. **Sorghum halepense** Pers. (=*Andropogon halepensis* Brot.) is common all over India, Burma and Ceylon in cultivated and uncultivated ground. It is distributed over most warm countries.

The seeds are demulcent and diuretic.

The grass is a good fodder both for grazing and for hay, but it is held to have injurious effects if eaten when too young or when the plants are stunted by drought. It has been reported from the Punjab that cattle after eating it had developed fatal head affections; and reports from various parts of Iraq indicate that the plant may cause the death of sheep or goats. This property is also well known in Australia, the United States of America and many other countries.

Banda: Bajra, Bara, Barru—; *Bengal*: Kalamucha—; *Berar*: Kartal—; *Bhabar*: Buru, Rikhon—; *Bombay*: Bara, Barru, Batal, Dacle, Kartal—; *California*: Arabian Millet, Evergreen, Means Grass, Millet—; *Canarese*: Kadukambu-hullu—; *Ceylon*: Johnson-weed, Sorghum-weed—; *Chanda*: Gallajari, Gudi, Paddajalla—; *Egypt*: Gerrau, Hashish-el-faras—; *English*: Aleppo Grass, Evergreen Millet—; *French*: Herbe de Para—; *Greck*: Kalamagra—; *Hindi*: Baru—; *Iraq*: Halaiyan, Sifrand—; *Kashmir*: Braham—; *Kohlu*: Baran—; *Kumaon*: Bikhonda—; *Malta*: Aleppo Millet-grass, Cannarecchia, Dente cavallino—; *Merwara*: Bowari—; *Punjab*: Baru, Barwa, Braham—; *Pushtu*:

Barua—; *Sakalave*: Fembamboloky—; *Shahrig*: Baran—; *South Africa*: Cuba Grass, Johnson Grass—; *Tamil*: Kadu cholam—; *Telugu*: Gaddijanu—; *United States*: Cuba Grass, False Guinea Grass, Johnson's Grass, Mean's Grass, Mears Grass—; *Uruguay*: Gramillon, Pato ruso, Sorgo de Alepo—.

2. **Sorghum vulgare** Pers. (=*Andropogon Sorghum* Brot.) is widely cultivated in India. It is cultivated in numberless forms in the tropical and subtropical regions, particularly in the Old World, and in the warmer parts of the temperate zones of both hemispheres.

According to Ayurveda writers the grain is cooling, and aphrodisiac, improving both appetite and relish for food. It is useful in the treatment of general disorders, diseases of the blood, piles, ulcers, tumours. It is highly indigestible, and causes constipation.

The seeds are diuretic and demulcent.

American Negroes like the decoction of the seeds as a remedy for urinary, bladder and kidney, complaints.

The adventitious shoots growing out of derelict stumps are fatal to cows and goats. In Guranjwala, Gujerat, and Shahpur districts, it is said to be poisonous until the rains are over, when the cattle eat it with impunity.

Afghanistan: Jaor, Jaoriturkimani, Jawars, Jowar, Kiosagi—; *Arabic*: Dakkn, Dhura, Dhurat, Jawars, Taam, Zura—; *Ashanti*: Atokoor—; *Babian Shahrig*: Jowari, Targhar—; *Baghwana*: Dhutar, Turi—; *Bengal*: Jowar, Juar, Kasajonar, Kurbi—; *Betsileo*: Variampemby, Varifemba—; *Bhabar*: Junali—; *Bombay*: Burru, Jaundri, Joar, Jondla, Jowari, Kangra—; *Burma*: Pyoung—; *Canarese*: Jolah, Kenjol, Nirgol, Shalu, Yengara—; *Catalan*: Melca, Menca, Mill africá—; *Central Provinces*: Jowar, Phag, Thuthera—; *Ceylon*: Cholum, Durra, Great Millet, Guinea Corn—; *Chinese*: Kao Liang, Shu Shu—; *Deccan*: Jondla, Jowari—; *Egypt*: Dokhn, Dura, Dura-belledi, Durra, Kaydi—; *English*: Broom-corn, Guinea Corn, Great Millet, Indian Millet—; *Ewe*: Fo—; *French*: Balai, Balai de jonc, Balai d'eau, Blé de Guinée, Houque à balais, Maïs de Guinée, Mil d'Italie, Mil d'Inde, Millet d'Afrique, Millet à balais, Grand Millet noir, Millet de Turquie, Gros mil, Mil d'Ethiopie, Sorgho, Sorgho d'Afrique, Sorgho à balai, Sorgho commun—; *Ga*: Akoko—; *Gambia*: Bassiqui, Bassiwulima, Kous, Manio—; *German*: Moorhirse, Sorghum—; *Gold Coast*: Guinea Corn—; *Gujerati*: Jowar, Juar, Sundia—; *Hindi*: Janera, Joar, Jondla, Jowari, Juar. Jundri, Juvarijondhla, Kanggni—; *Hova*: Ampemby—; *Iraq*: Dhurah, Idhrah baidha—; *Khasi*: U Krai—; *Kolami*: Gangai—; *Konkani*: Juar—; *Krepi*: Fo—; *Krobo*: Koko—; *Kumaon*: Jowar, Junali—; *Kurdish*: Zurat spi—; *Languedoc*: Millangue, Millanque—; *Lao*: Ya pong—; *Las Bela*: Jowari—; *Lepcha*: Ra-Kong, Tsung-Kong—; *Makran*: Mohammadisa, Sohro—; *Malayalam*: Chavela—; *Mal Paharia*: Sissua—; *Malta*: Dariseed, Durrah, Karabocc, Melica, Saggiwa—; *Marathi*: Jondhala, Juari, Kadval, Shalu—; *Mundari*: Gangae, Ganggai—; *North-West Provinces*: Bajrahopanwa, Chotijuar, Juar, Junri—; *Oudh*: Bajrahopanwa, Chotijuar, Juar, Junri—; *Portuguese*: Milho—; *Punjab*: Bajrahupanwa, Chari, Chotijuar, Chotijunri, Joar, Junri, Ka—; *Russian*: Sorgo—; *Sakalave*: Bakaka, Morama—; *Sanskrit*: Dirghamala, Dirghashara, Ikshupatraka, Kshetrekshu, Raktakhumah, Shikhari, Vrittatandula, Yavanala—; *Santali*: Juar—; *Sarakhala*: Tarighara—; *Sema*: Atsünákhi—; *Sinhalese*: Karaliringu—; *South Africa*: Kaffir Corn, Kafir Corn—; *Spanish*: Alcandia, Saina—; *Tamil*: Cholum—; *Telugu*: Bondajanu, Janu, Jonna, Jonnalu, Kondajanu, Tellajanu—; *Turkish*: Baiyadh dari—; *Twi*: Atoko, Awi, Kokorte—; *Uruguay*: Maiz de Guinea, Sorgo—; *Visayan*: Batad—; *Zulu*: Amabele, Imfe—.

STENOTAPHRUM.

This genus consists of 7 species, found mainly on the shores of the tropical and subtropical seas, four being confined to Madagascar and the neighbouring islands.

Stenotaphrum glabrum Trin. occurs in the plains throughout India. It is found in Lower and Upper Guinea, also in South Africa from Cape Town to Natal, on the American shores of the Atlantic from South Carolina to the La Plata and in the Pacific from Southern Mexico to Australia. It has been introduced in Southern France and Italy.

The rhizome is diuretic, and the decoction is used in Brazil as a diuretic and sudorific.

America: St. Augustine Grass—; *Australia*: Buffalo Grass—; *Bahia*: Grama da Praya—; *Bermuda*: Crab Grass—; *Florida*: Mission Grass—; *Jamaica*: Pimento Grass—; *La Reunion*: Chiendent de boeuf—; *Mauritius*: Herbe bourrique—; *Natal*: Tweek Grass—; *St. Helena*: English Wire Grass, Mat Grass—; *Transvaal*: Tweek Grass—.

STIPA.

This is a genus of over 100 species, spread over the temperate and tropical regions of both hemispheres.

S. inebrians Hance, *S. sibirica* Lam., and *S. viridula* Trin. are actively poisonous; *S. vaseyi* Scribner is a very active narcotic.

I. Leaves smooth; ligule oblong. Callus short, conical. Anther-tips bearded ... ... 1. *S. sibirica*.
II. Leaves scaberulous: ligule lanceolate. Callus scabrid, top bearded. Anther-tips naked ... 2. *S. capillata*.

1. **Stipa sibirica** Lam. is found in the Western temperate Himalaya, from Kashmir to Kunawar up to 8,000-9,000 ft. altitude, and to the Black Mountains. It extends to Afghanistan, Siberia and Korea.

This grass is actively poisonous and is reported to have caused death in horses and other domestic animals.

2. **Stipa capillata** Trin. is found in Western Himalaya, ascending up to 11,000 ft. in Kashmir. It extends westwards to Spain, Dahuria, China.

This grass frequently kills sheep, not, however, by a direct poisonous action, but by its glumes working through the skin into the vital organs.

THELEPOGON.

The one representative of this genus, **T. elegans** Roth., occurs in Central India, the Konkan and Malabar, extending to tropical Africa.

In Northern Nigeria it is fed to horses as a tonic. It is described as very bitter.

Hausa: Dataniya, Dwatana—; *Katagum*: Dandata—.

THEMEDA.

This genus numbers about 15-16 species, all natives of the tropical and subtropical regions of the Old World, mostly Indo-Malayan.

Themeda triandra Forsk. is found in the hotter drier parts of India, from Upper Bengal to Travancore, ascending the Himalaya to 3,000-4,000 ft. It also occurs in Burma and Ceylon, ascending to 4,000 ft. It is one of the commonest grasses of the drier regions of Africa, often forming extensive associations. It extends to Australia and all the warm regions of the Old World.

This plant is said to be used medicinally in China. It has been found to yield hydrocyanic acid.

Canarese: Bettanchi hullu, Gondamanchi hullu, Thodda anji hullu—; *Indo-China*: Quan—; *Natal*: Insinda—; *South Africa*: Rooi Grass—; *Tamil*: Erigai thattu pullu—.

THYSANOLAENA.

T. procera Mez. (=*T. agrostis* Nees=*T. acarifera* Nees and Arnot.), the only species of this genus, is found in subtropical Himalaya, from Kumaon eastwards and the Khasia Hills at altitudes of 4,000-5,000 ft., in Behar on the Parasnath, in the Deccan, Burma, Nicobar Islands, and the Malay Peninsula, where it abounds in dry banks in the hills at 1,000 ft. altitude and upwards from Penang to Malacca. It extends eastwards to New Guinea.

A decoction of the root is used in Chota Nagpur as a mouthwash during fever.

Birja: Jopono—; *Gond*: Phulbari—; *Hasada*: Durhitasad, Duritasad—; *Indo-China*: Dong trung ha thao, Dot, Le, Ong anh, Xay—; *Khond*: Saderi, Saperi—; *Kolami*: Dodri, Gara-jonor—; *Malay*: Buluh tubaro—; *Mundari*: Garajapono, Garajono—; *Naguri*: Durhitasad—; *Santali*: Bushnia, Karsar—; *Saora*: Kondachipuru—; *Uriya*: Phulosoro—.

TRITICUM.

This genus consists of 20 species, natives of the Mediterranean region and of Western Asia.

T. aestivum Linn. is used medicinally in Europe, and three of its races—*T. amyleum* Ser., *T. durum* Desf., *T. spelta* Linn.—are used as tonics in Brazil.

Triticum aestivum Linn. (=*T. sativum* Lam.) is cultivated in many parts of Northern India and the Deccan Peninsula, especially in the North-West, and up to 13,000 ft. in the Himalaya and Tibet.

Ayurveda writers describe wheat as cooling, oleagenous, tonic, aphrodisiac, laxative, and fattening, improving appetite and relish for food. They held it as a useful medicine in general disorders of health; but they admitted that it was hard to digest.

'The fine floure', says Gerard, 'mixed with the yolke of an egge, honey and a little saffron, doth draw and heale byles and such like sores, in children and in old people, very well and quickly. . . . Slices of fine white bread laid to infuse or steepe in Rose water, and so applied unto sore eyes which have many hot humours falling into them, doe easily defend the humour, and cease the paine. The oyle of wheat pressed forth between two plates of hot iron, healeth the chaps and chinks of the hands, feet and fundament, which come of cold, making smooth the hands, face or any other part of the body.'

And Culpeper: 'The oil pressed from wheat by means of plates of iron or copper, heals tetters and ringworms, if used warm. The green corns chewed, and applied to the bites of mad dogs, heals them; wheat-bread poultices made with red wine, and applied to hot, inflamed, or blood-shot eyes, helps them. Hot bread poultices applied three days together, heals Kernels in the throat. Wheat flour mixed with juice of henbane stays the flux of humours to the joints, if laid thereto; or mixed with the yolk of an egg, honey or turpentine, draws, cleanses, and heals boils, plague sores, or foul ulcers. It is more useful for food than medicine; though a poultice made of it with milk, easeth pains, ripens tumours and imposthumations; and a piece of toasted bread dipped in wine, and applied to the stomach, is good to stay vomiting.'

Wheaten flour, bran, starch, and bread-crumb are still very much in demand as popular medicines in Europe and in all places inhabited by European settlers or their descendants.

The flour, which is officinal in France, is esteemed as an external application in erysipelas, burns, scalds, and various itching and burning eruptions. A mixture of flour and water is used as an antidote in cases of poisoning by salts of mercury, copper, zinc, silver and tin, and by iodine.

Bread is formed by making flour into a paste with water, with the addition of yeast, setting it aside to ferment, and then exposing it to the heat of an oven. A poultice is often made by boiling bread with milk; its effects are similar to those of a flaxseed poultice although it does not hold the heat so well. Bread-crumb is useful for giving bulk to pills, and for making poultices.

Bran is laxative, and may be used with advantage to prevent costiveness. Bran bread made from the unsifted flour, is an excellent laxative article of diet in some dyspeptic cases, and, owing to its freedom from starch, in diabetes. Bran poultices are useful for many purposes. Bran is sometimes used in the form of a decoction or infusion, as an emollient bath, and also internally as a demulcent.

Starch prepared from wheaten flour is officinal in all pharmacopoeias. It is employed for sprinkling over inflamed surfaces, to absorb acid secretions, and prevent excoriation. Mucilage of starch is valued in pharmacy for many purposes, and medicinally as a demulcent. In surgery it is occasionally employed for stiffening bandages.

Gluten is a term popularly known in connection with the names of 'gluten flour' and 'gluten bread', used and recommended especially in connection with the dietary of diabetics when starchy foods are to be administered in small amounts or altogether prohibited. These preparations are legion and in many instances are sold under claims which are as false and misleading as they are cruel in the hope of which they hold out to the sufferer from the disease.

In China the grains are roasted and are considered useful in colliquative sweating, especially in tuberculosis in women.

Afghanistan: Ganam, Gandam—; *Afrikaans*: Koring—; *Arabic*: Burr, Hintah—; *Ashkobi*: Spinghanam, Wasaghanam—; *Bagwana*: Dayak, Kandahari, Kub. Shorawaki, Shuthardandan, Sundia, Trimali—; *Bengal*: Gam, Giun. Gom—; *Bombay*: Gahu, Ghawn, Ghawutghum, Gium, Gohum, Kapale, Marghum—; *Brazil*: Trigo. Trigo candeal, Trigo tremez—; *Burma*: Giyonsaba Gyungsaba—; *Canarese*: Godhi—; *Catalan*: Blat menut, Xeixa, Xexa—;

Central Provinces: Ghubot, Seonikar—; *Chinese*: Ch'ao, Cheng Ping, Chiang, Hsiao Mai—; *Deccan*: Gohun—; *Dutch*: Tarwe—; *English*: Wheat—; *French*: Blé, Blé cultivé, Blé marcel, Blé marcet, Blé de mars, Blé d'été, Blé trémois, Froment, Froment cultivé—; *German*: Weizen—; *Greek*: Sitari—; *Gujerati*: Gawn, Ghavum, Govum—; *Hadramaut*: Burr—; *Harboi Hills*: Ghanam, Kholam, Shirukh—; *Hausa*: Alkama—; *Hindi*: Gehub, Gehun, Giun, Kunak—; *Hova*: Lafarina, Varimbazaha—; *Hungarian*: Buza—; *Italian*: Frumento, Grano—; *Jhalawan*: Geroli, Sundia—; *Kharan*: Pashmik—; *Khuzdar*: Geroli—; *Kila Saifulla*: Ghanam, Sarghanam, Spinghanam—; *Kirta*: Barkhani, Sungsillah—; *Konkani*: Gahum—; *Languedoc*: Blad, Bladet, Blat, Bled—; *Malayalam*: Gendum, Kotanpam—; *Malta*: Spring Wheat, Grano d'estate, Marzuolo, Civitella, Tomnija—; *Marathi*: Gahum, Gahung—; *Mastung*: Ghanam, Kholam—; *Michi*: Shruk, Tokar, Tomar, Tro—; *Nigeria*: Common Wheat, Egyptian Wheat, Miracle Wheat, Mummy Wheat, Wheat—; *North-Western Provinces*: Gehun—; *Oudh*: Gehun—; *Pab*: Khisankah—; *Persian*: Gandum—; *Portuguese*: Trigo—; *Punjab*: Do, Dro, Gehun, Kanak, Nis, Rozatt, To, Zud—; *Quetta*: Pashmik—; *Roumanian*: Griu—; *Russian*: Pshenitza—; *Sadani*: Gehom, Gohom, Gom—; *Sanskrit*: Arupa, Bahudugdha, Godhuma, Kshiri, Mlenchhabhojana, Nistusha, Rasala, Saman, Sumana, Yava, Yavana—; *Saruna*: Khalam—; *Shahrig*: Boja, Gandun, Ghanam, Kholam—; *Sinhalese*: Tiringu—; *Sohrab*: Pesur, Puzho, Shuthardandan—; *Spanish*: Trigo candeal, Trigo chamorro, Trigo común, Trigo jejar, Trigo marzal—; *Tamil*: Godumai, Godumbaiyarisi—; *Telugu*: Godumulu—; *Wad*: Sundia—; *Zulu*: uKolo, uKolweni—.

a. **Triticum durum** Desf.—*Portuguese*: Trigo durasio—.

b. **Triticum spelta** Linn.—; *Arabic*: Hunta, Qamh, Qamh m'ghejir, Qamh ne ejghe, Qamh stejri—; *Catalan*: Escanya major, Espelta—; *Egypt*: Hunta Qamh—; *French*: Ampeutre, Engrain, Froment rouge, Grande épeautre, Ingrain—; *Spanish*: Escanda, Espelta—.

c. **Triticum amyleum** Ser.—*Brazil*: Trigo branco—.

VETIVERIA.

This genus consists of 7 species, distributed throughout the tropics of the Old World; one has been introduced into the New World.

Vetiveria zizanoides Stapf. (=*Andropogon muricatus* Retz. =*A. squarrosus* Cooke) is found practically over the whole of India, and eastwards to Burma. It is very common in every part of the Coromandel Coast, and in Bengal and Burma, where it meets with a low, moist, rich soil, especially on the banks of the water-courses. It covers large tracts of waste land in Cuttack. It inhabits the plains of the Punjab and North-West Provinces, and ascends into Kumaon, 1,000-2,000 ft. in altitude. It is cultivated in Rajputana and Chota Nagpur. It occurs occasionally in Malay gardens, and extends to the West Indies, Brazil, and Lower Guinea. So far it has been found in the wild state only in tropical Asia.

Ayurvedists describe the root as bitter, cooling, stomachic, astringent and an antidote to poisons. They recommend its use in burning sensations, bilious fevers, sweats, foul breath, thirst, strangury, ulcers, and diseases of the blood.

Yunanists hold the root as cooling to the brain, bitter and soporific. They recommend its use in spermatorrhoea, headache, and diseases of the blood.

An infusion of the root is given as a febrifuge, and a powder in bilious complaints. It is regarded as stimulant, sudorific, stomachic, and refrigerant.

The essence is used as a tonic.

A paste of the pulverised roots in water is also used as a cooling external application in fevers.

In Guinea the infusion of the roots is used as a tonic and an emmenagogue. In China it is chiefly used to remove dandruff.

The root and stem are Ayurveda cures for snake-bite and scorpion-sting, but Mhaskar and Caius have shown experimentally that neither is an antidote to either snake or scorpion venom.

Arabic: Izkhir, Usir—; *Bengal*: Bena, Khaskhas, Khor, Kuskus—; *Bombay*: Khasakhasa, Vala—; *Burma*: Miyamoe—; *Canarese*: Dhappa sajjai hullu, Kadu karai, Lavancha—; *Chinese*: Ko Cha—; *Cutch*: Vala—; *Deccan*: Khaskhas—; *English*: Cuscus, Khuskhus, Koosa—; *French*: Chiendent des Indes, Vétiver—; *Gujerati*: Valo—; *Hindi*: Bala, Balah, Bena, Ganrar, Kaskas, Khas, Onei, Panni, Usir—; *Indo-China*: Chuoc mat, Huong bai—; *Kolami*: Sirom—; *La Reunion*: Vétiver—; *Malay*: Akar wangi—; *Malayalam*: Ramachchamver, Vettiver—; *Marathi*: Vala—; *Mundari*: Birnijono, Sirum, Sirumjono—; *Oudh*: Tin—; *Persian*: Bikhiwala, Khas—; *Philippines*: Moro, Raiz de Moro—; *Punjab*: Panni—; *Sadani*: Birni—; *Sanskrit*: Abhaya, Amrinala, Avadaha, Dahaharana, Gandhadhya, Haripriya, Indragupta, Ishtakapatha, Jalamoda, Jalashaya, Jalavasa, Rambhu, Katayana, Laghubhaya, Lamajjaka, Nalada, Ranapriya, Samagandhika, Sevya, Shishira, Shitamulaka, Sugandhimula, Ushira, Vira, Virabhadra, Virana, Virataru, Vitanamulaka—; *Santali*: Sirom—; *Sinhalese*: Saivandera, Savandramul—; *Tamil*: Ilamichamver, Vakil, Vettiver, Vilhalver, Viranam, Virkel, Viyal—; *Telugu*: Avurugaddiveru, Kassavu. Kuruveru, Lamajjakamuveru, Vettiveru, Vidavalliveru—; *Tharu*: Khatra—; *Urdu*: Khas—; *Uriya*: Bena—.

ZEA.

The only species of this genus is of American origin, in cultivation in all warm countries of the world.

Zea mays Linn. is widely cultivated in India.

According to Hindu writers the grain is nutritive, demulcent, emollient, diluent, and absorbent; but, it is liable to produce flatulence.

It is considered by Mahomedan writers to be resolvent, astringent, and very nourishing; they consider it to be a suitable diet in consumption and a relaxed condition of the bowels. It is analgesic, and a decoction is recommended as a hip-bath for piles.

In the Konkan an alkaline solution is prepared from the burnt cobs and is given in lithiasis. In the Central Provinces the centre of the cob, deprived of the seeds and reduced to an ash by burning, is given in combination with common salt in bronchial catarrh and whooping cough.

In Europe and in the United States of America the grain is much used as a valuable article of diet for invalids and children. Corn bread contains more nourishment than wheaten bread, and is a better diet for persons suffering from diseases of the liver, or of the kidneys.

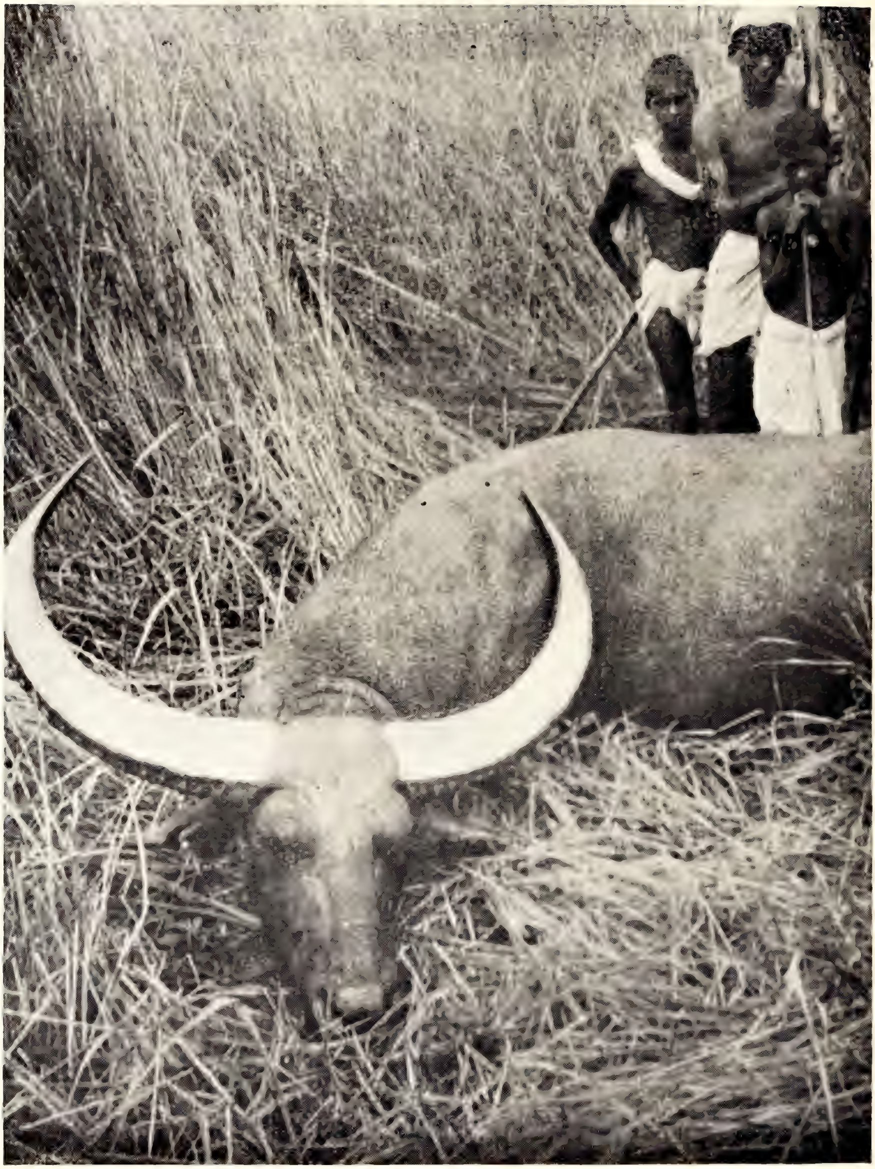
In Greece the silky stigmata are used in decoction in diseases of the bladder, a custom which also obtains in the Philippine Islands, where the plant is considered diuretic. The styles and stigmas have now been generally recognised as diuretic, anodyne, and demulcent. Under the popular name of 'corn silk', a liquid extract is sold as a remedy in irritable conditions of the bladder with turbid and irritating urine; it has a marked diuretic action, Zea, or the stigmas and styles, is employed in acute and chronic cystitis, and in the bladder irritation of uric acid and phosphatic gravel. It has also been employed in gonorrhoea, and has been affirmed to be a useful diuretic and even cardiac stimulant in the dropsy of heart disease.

The meal is made into emollient poultices. It is also made into mush by boiling, but its exclusive use gives rise to a skin disease.

In Cambodia the grains are prescribed in angina, and the stigmas in paludism.

Animals are sometimes poisoned from eating the green plant. Infants fed on Indian corn flour grow up rickety; it contains only about eighteen grains of proteic substance to the pound. The male flowers are said to contain hydrocyanic acid. The pollen is a possible cause of hay fever.

Accra: Abblay—; *Afghanistan*: Jaoari, Jaori, Jaorikhurdani—; *Afrikaans*: Mielie—; *Annam*: Bap ngo, Lua ngo—; *Arabic*: Durahkisan, Durahshani, Hintaherunu, Khalavan, Khandaruz, Zurratulmakkah—; *Ashanti*: Aburow—; *Awuna*: Akple—; *Bengal*: Bhutta, Janar, Kokka—; *Bombay*: Barjoar, Buta, Macka, Makai—; *Brazil*: Zaburro—; *Burma*: Pyaungbu—; *Cambodia*: Paut, Put—; *Canarese*: Goinjol, Makkai jola, Mekkejola, Musukujola—; *Catalan*: Blat de moro—; *Ceylon*: Cholum—; *Chinese*: Pang Tzeu, Yu Shu Shu—; *Chota Nagpur*: Jonar—; *Cochin China*: Bap ngo, Lua ngo—; *Dardanelles*: Kalamasitaro—; *Deccan*: Makkajari, Makkajowari—; *Dutch*: Mais—; *Egypt*: Durra—; *English*: Indian Corn, Maize—; *Ewe*: Akple, Blikple—; *Fanti*: Abru, Aburow—; *Fiji*: Sila ni papalagi—; *French*: Blé de Barbarie, Blé d'Espagne, Blé de Guinée, Blé d'Inde, Blé d'Italie, Blé de Rome, Bléture, Blé de Turquie, Froment des Indes, Graine de Turquie, Maïs, Maïz, Mil d'Espagne, Gros millet des Indes, Troquet, Truquiet, Turquie—; *Ga*: Able—; *Garhwal*: Junala, Mungari—; *German*: Tuerkische Korn, Tuerkisher Weizen—; *Gold Coast*: Agbahdor—; *Guam*: Maeis—; *Gujerati*: Makkari—; *Hasada*: Jonra—; *Hausa*: Masara—; *Hindi*: Barajuar, Bhotta, Bhuta, Bhutta, Jawdra, Junri, Kukri, Makai, Makka—; *Hova*: Kasobotso, Katsamanga, Katzaha, Tsako, Tsakotsako—; *Indo-China*: Bao, Bap, Cennaron, Khao phot, Mali, Ngo, Ngoc thuc thu, Put, Sali—; *Iraq*: Indhrah safra, Idhrat-ash-sham—; *Italian*: Grano siciliano, Grano turco, Melicatto Meliga—; *Kashgar*: Conac—; *Khasi*: U riew hadem—; *Kila Saifulla*: Makai, Maki—; *Konkani*: Maeo, Zonallo, Zondllo—; *Krepi*: Adakple, Blikple, Kple, Kpledzi, Watsikple—; *Krobo*: Blaifo—; *Kumaon*: Bhutta, Junala, Mukni—; *Kurdish*: Gumnah shami, Zurat zard—; *Languedoc*: Artho, Avari, Avati, Blamari, Blarama, Garouilhé, Garouillet, Millaral, Millargo, Millargou—; *Laos*: Khao phot, Khot—; *Lepcha*: Kun-tsong—; *Lynngam*: Soh rikhaw—; *Madagascar*: Katsabazaha, Katsakandevolahy, Sako—; *Malayalam*: Cholam, Makka cholam—; *Malta*: Frumentone, Granoturco, Indian Corn, Kamh irrum, Maize—; *Marathi*: Bonda, Maka—; *Menomini*: Apesapimin—; *Moldavia*: Popusoiu—; *Mundari*: Gorajonra, Gurulujonra, Jondra, Jonra, Loeongionra—; *Naguri*: Jondra—; *North-West Provinces*: Barajuar, Bhutta, Junri, Maka, Makai, Makka—; *Persian*: Bajri, Gaudumemakkah, Koshahemakki—; *Philippines*: Borona, Maiz—; *Portuguese*: Milho, Milho grosso—; *Punjab*: Barajuar, Chhale, Juar, Kukri, Kuthi, Mak, Makkei, Makki—; *Rajputana*: Mukkha—; *Roumanian*: Porumb—; *Russian*: Kukuruva, Mais—; *Sanskrit*: Kandaja, Mahakaya, Makaya, Samputantastha, Shikhalu, Yavanala—; *Santal*: Jondra—; *Sarakhala*: Makkai, Maki—; *Sema*: Kolakiti—; *Shahriq*: Badaghariuari—; *Sierra Leone*: Amarsk Kabe, Nvin—; *Sind*: Barajuar, Makkai—; *Sinhalese*: Bada iringu, Tringu—; *South Africa*: Mealie Corn, Mealies—; *Spanish*: Maiz, Trigo de las Indias, Trigo de Turquia, Zara del Perú—; *Suto*: Poone—; *Tamil*: Makkasholam, Turaka cholam—; *Telugu*: Makkanzonnalu, Mokkajanna, Mokka jonnalu—; *Toba*: Makai—; *Tongking*: Bap ngo, Lua ngo—; *Transylvania*: Cucuruz—; *Turkish*: Misir, Sari dari—; *Twi*: Aburow—; *Urdu*: Makai—; *Uriya*: Buta, Maka, Mokha—; *Yemen*: Rumi—; *Zomba*; Chimanga—.



The Rogue Buffalo, Kosi River, horn sweep 96 in., girth 17¼ in,

SHOOTING WILD BUFFALO IN THE KOSI RIVER SWAMPS.

BY

J. E. Hall.

(*With one plate*).

It was quite by chance that I discovered there were a few Buffalo left in the exntensive Kosi Duars, descendants most probably of the numerous herds that once populated these jungles, which Ingles makes full mention of in his *Tent Life in Tigerland.* Consisting of alternate stretches of high *Kas* grass and *Jhowa* (a kind of Tamarisk) scrub, extremely dense, and growing up to 20 feet in height in places; the jungle is intersected by numerous streams. These are either branches of the main Kosi, or subsidiary streams. Except for high ground in places most of the area is swamp, infested with tiny but extremely vicious mosquitoes. In places there are extensive thickets of dog rose and *Igar* (a peculiar type of tree with white flowers, overrun with red ants). Formerly these jungles especially along the Kosi and Ganges held innumerable Tiger, Buffalo, Hog-Deer, Pig, and occasionally a Rhino strayed in from further north (Nepal). It was in this area in the Purnea District that the Shillingfords made such mighty bags of Tiger. With the extension of cultivation however most of the jungle land has been cultivated; what remains is so small and so subject to annual inundations from the river floods, that little or no game remains. A few pig and an occasional hog-deer or nilgai, with sometimes a straying panther is the most one can find. It was after working with most disappointing results in these riverside jungles, with an expenditure of backbreaking effort that eventually I stumbled on an excellent block comprising some 20,000 acres of high *Kas* and *Jhowa,* which being a shooting preserve of a local Raja had attracted all the buffalo from the surrounding area. The migration of the buffalo being helped along by the extension of cultivation, and reclamation of former swamps. I, however, was lucky enough to know the Raja well, having played out many a hard fought polo match both for and against him. On my approaching him he gladly gave a general shooting permit; also not being extra keen about shikar he asked me to see if the jungle was worth preserving, it having been reserved years ago in his father's time; and with the increasing land values the settlement of the area for cultivation was practically the only course left open to him.

Tracking being out of the question, recourse was had to questing in the most likely places with the help of an elephant. Buffalo were found in fair numbers; but after bagging two of the largest herd bulls, as no solitary was seen, the writer was forced to the conclusion that many of the buffalo were half-bred, probably from tame buffalo run wild, and joining their wild brethren. This being I was told a not uncommon occurrence. The better of the two bulls shot had a horn sweep of 93 inches with a girth of 19¼; the horns were very worn and splintered at the tips. Height from point of shoulder to hoof 62 inches (15½ hands). He was very heavy and massive and covered with scars. Being told by the junglewallas that April was the best month, when most of the rivers and streams were either dry or low, with the greater part of the *Kas* burnt, I decided on a shoot in April 1933, my intention being to bag a solitary bull. It was perfectly dreadful, excessive heat with a constant high breeze raising continual sandstorms. The skin blistered and peeled off most of my arms and face, my lips were cracked and bleeding after the first day. I tried to do too much and eventually had to give up with sore eyes caused by the amount of sand that had got into them. The shoot however was worth all the discomfort, a really fine solitary bull being bagged on the fourth day, besides some enormous 'Croc'.

We used to start out from the mango tope on the fringe of the jungle, where camp was situated, on the elephant about 4 a.m., swim two streams of the Kosi, and quest the most likely places on foot. The party comprised two locals, my orderly and myself. Getting the bull was sheer luck, we had had a very trying day and were resting in the shade of a high bank when the sun was at its hottest, about half past one. There were a couple of cotton teal in an open bit of water about 80 yards away and I took a pot shot with the little .22 bagging one. One of the locals waded out to get it, he had hardly gone 15 yards when he ducked under water, made his way with only his head above water to a small patch of reeds, and motioned with his hand for me to come at once. With great caution I waded out to him, with only my head above water and the rifle likewise held clear. Putting my head above the reeds and looking in the direction indicated, I got the shock of my life. 40 yards from me there was an enormous head on the surface of the water. As the owner would shake his head to drive away the flies his huge horns would show. To take a correctly placed shot was quite out of question as his body was practically submerged. I gave a shout. The effect was electric, the bull heaved himself up and I fired at right angles behind the shoulder. After a desperate stumble he caught sight of the orderly and the remaining local who were climbing up the bank, and went all out for them. Passing me within 10 yards I let him have the other barrel in the neck; it did not seem to have the slightest effect. I just managed to get in a third shot into the small of his back as he topped the bank, and then the fun started. Rushing up the bank after him we just managed by leaping into a small nullah to avoid a most vicious charge. He then went into some horribly dense wild rose thickets.

Following up the blood spoor, we experienced another charge from the side, but this was not too effective as he blundered into an *Igar* tree. I let him have another shot in the chest and he came down. The orderly, silly ass, in a wild desire to 'hallal' the bull grabbed hold of one of the horns and after that did not know what hit him. He was sent backwards at least 10 feet by the dying sweep of the horns. His thigh was severely bruised, at one time I thought it broken, and he could not walk for days afterwards. Had the point of the horn struck him his number would have been up. The bull, however, was a grand beast, typical solitary, with horns 19¾ inches in girth, 109 inches tip to tip across forehead, 17 hands in height. I checked these measurements with the greatest care. I have never seen a more massive animal.

I had been granted permission to shoot one cow buffalo, but so far had seen nothing exceptional, though heads of 7 and 8 feet (as far as I could judge) were seen. However, by this time I had got to know the jungle better and my uncle who had arranged to join me, in the meanwhile decided against foot-slogging; his weight is nearly 14 stone. We decided to return in October. Towards the latter half of that month we marched nearly 18 miles from the station in pouring rain and pitched camp in the Raj Katcherry. The tehsildar had obtained the loan of two staunch elephants. Without going into detail I may state that between us we bagged a fine bull, though not as big as the one obtained in April; this was uncle's, though I had to help hard, especially as he went for my elephant. We also shot a really fine cow. This latter cost us two days hard work, but eventually we managed to isolate her from a herd of some dozen individuals and I got her in two picked shots without indiscriminate firing as is usual in bagging a herd animal. She was worth the trouble and effort, her horns measuring 13 inches in girth and 112 inches in sweep. This cow was very old and scraggy. I was also compelled to shoot a fine young breeding cow who charged and chivvied my orderly and the skinners. She would not leave a certain patch of jungle, where we afterwards found a young calf. I felt so cut up about this that I abandoned the shoot. We tried to rear the calf but it was sickly having some sort of cow-pox, and it succumbed after a few days.

Some time later I had rather an amusing letter from the tehsildar, part of which I give below:—

SRIMATA,
21*st* *March,* 1934.

'MY DEAR J. E. HALL, ESQ.,

I did not receive any letter since a long time. Perhaps you have forgotten me at all, but I don't. I have reported that the buffalo who was shot by your uncle, has become lame, and now it is turned into ferocious condition. One man has been wounded by that very buffalo and he died as soon as he was approached to —hospital, etc, etc.

Yours sincerely,
AZIZ KHAN,
Tehsildar.'

This was serious for, as far as I knew, neither uncle nor myself were responsible for wounding any buffalo. I was unable to obtain leave just at the time, and before I could get away two more men had been killed. Eventually I went with a friend and we succeeded in bagging the culprit, a herd bull, probably a crop raider, who had two hammered lead slugs in him, on the forearm and shoulder. It appears that he used to lie up near water and if anybody, cowherd or grasscutter passed his side he would rush and gore or trample them to death. When he was shot he had three deaths and some four maulings to his discredit. He had a habit of raiding the paddy fields, where most probably he got wounded from a machan, and going for anybody who attempted to drive him away. He was a fairly big bull 16 hands high, with horns measuring 96 inches in sweep by 17¼ inches in girth. His head is shown in the accompanying plate. My friend, White, who was with me on this shoot, and myself had a rather narrow shave from a herd of buffalo on this trip. We were sitting towards dusk smoking, when we saw a herd containing a fine animal which in the uncertain light we took to be a bull crossing a stream to our left. We rushed for the spot, and I almost bumped into the buffalo in question. To the sound of my shot there was a general stampede by the herd in the high grass in our direction and we had to run pretty fast to clear them. The animal fired at turned out to be a cow but with a fine head measuring 9 feet 4 inches in sweep (112 inches). My punishment consisted in carrying that head covered with blood, weighing at least 80 lbs. or more, for very nearly 7 miles. We lost our way in the dark, floundered into swamps, and did not get into camp till the night was half passed. I refused to abandon the head under any circumstances.

Reading the above one must not get the idea that we habitually shot cows, in fact only three were shot during the course of three years, of which one was in error (the one above), one for a collection (the first), and one in sheer desperation to avoid a tragedy.

When the heavy jungle is taken into consideration it is really a wonder that more accidents of a like nature did not occur; we were however most careful on this point, and once I let a beautiful cow go, with I think at least 12 feet horns (sweep); she would have been a trophy worth keeping in a national collection, but she had a small calf at heel, and so was not molested. I never saw her again in spite of hunting for her for days at a time, with a cine camera.

It should also be borne in mind that arrangements had been made to clear the jungle for cultivation; and if we spared, the villagers did not. I rather flatter myself that as a result of a personal appeal to the Raja and his Estate Manager it was decided to stop the removal of the jungle and declare the area a closed preserve. This has been done, and though I lose by not being allowed to shoot, it is much the better arrangement; as I think that the wild buffalo is a species that is fast dying out and in need of very careful and strict preservation. I have since had a couple of days after hog-deer and panther in these jungles and note with the utmost satisfaction that the wild buffalo are increasing, so much so that I think steps will have to be taken to reduce their numbers, by shooting out obviously half bred and inferior animals. The area being circumscribed can only support a limited number otherwise pox and rinderpest will take toll in a drastic fashion. Now a few notes with regard to kit, etc.

Use the heaviest rifle you can, mine is a 450/400 H.V. double barrel; bullets should be either solid or with just the tip exposed, a split bullet breaks up on impact and has no penetration. The best shot I find is at the triangle. Pig-sticking taught me this. The triangle is that part of the back about 12 inches by 9 inches just behind the last rib, and level with the spine. If you get the spine the animal is paralysed in the hind legs and cannot move, if you go a little low the bullet takes him in the kidneys or liver and he cannot go very far. Unless perfectly placed low down a lung shot leaves an animal with plenty of go and he may take you far with the chance of a charge in the process. When questing on foot, search all the open spaces in the high grass between the heavy jungle and the crops up to about 8 a.m. You usually find a bull or so grazing after a night out. In the hot weather quest along the banks of streams in the jungle or stalk the wallows and pools, the best time for this is between 12 noon and 2 in the afternoon. Again in the evening quest along the maidans as in the morning for the buffalo coming out to graze at night. Following them up in the dense cover that exists is impossible and decidedly dangerous.

Buffalo horns go in all shapes though the bulls have mostly horns set in an arc of a circle, either more or less circular. Cows on the other hand show great variety: turn over horns are common, straight out from the head is another type. I do not agree with there being two varieties of buffalo, in my opinion there is only one type, with variations, either due to environment, or interbreeding with tame animals run wild. Shooting on foot is the cream of the sport though fearfully exhausting in the hot weather; shooting off elephants in heavy cover if only one or two elephants are employed requires profound patience, and a considerable knowledge of woodcraft. Shooting with lines of elephants is glorified butchery, which I have no experience of. When shooting off an elephant in high *Kas* jungle, where the buffalo are invisible at any distance beyond a few yards, an invaluable tip is to look out for paddy birds (egrets) who settle on the backs of the animals to pick off ticks, etc. Any wheeling by such birds about a particular spot is a sure indication of the presence of buffalo. You should also have a shot gun loaded with 'Lethal' ball handy as very often a hog-deer rises up practically under the elephant's trunk. I once lost a fine stag by not being prepared. In this way I have been lucky enough to bag some good hog-deer and *kakur* or barking-deer. An occasional panther is sometimes raised, but as a rule these brutes squat in a bush and refuse to move unless almost stamped upon; and when they do break all one sees is a flash of yellow and black. It is far more convenient to sit on the pad and drive the elephant oneself, in this way there is no chance of the mahout getting in the line of sight. I have heard of one unfortunate's head being blown off by an excitable griff. Moreover you are in the best position to take a snapshot. Driving an elephant is not difficult of attainment especially if you tip the mahout to show you the particular tricks of his individual beast. Always have the mahout on the pad behind you, as he can also control the animal by command. Shooting off a howdah makes the shikari frightfully sick, besides which howdahs are very seldom obtainable. Some practice is necessary to shoot off an elephant with any accuracy. I usually fix a light slip of wood with insulating tape along the barrels; this covers my sights and permits my using the rifle as a shot gun. Elevation should be judged according to range, but in actual practice shots are seldom taken beyond point blank distance. Avoid shooting a head out of a collection of bulls, these are usually good though inferior to the solitary bulls. These gatherings are of younger bulls too undeveloped to contest for the mastery of a herd, and if you do shoot one you may find yourself in a predicament with the remainder refusing to leave the dead one and pawing up the ground, smelling the blood, bellowing, and generally making most trying demonstrations, which if there is not a tree handy as once happened to me is decidedly bad for the nerves. Avoid a cow with a calf like poison, meddling with her means that you will have to shoot darned fast and straight in the end to avoid someone being hurt. Look at the base of the horn with a good glass, if it is flat, triangular, with a frontal breadth of at least 8 inches and heavily corrugated it's a bull. A rounded smooth horn with very little taper in the first half of its length belongs to a cow. Spread in a head is just as important as length, so try to bag a bull with the tips of his horns well apart. Horns and skulls are easily cleaned and mounted on shields, see that you pour kerosine oil or turps at frequent intervals into the outer sheaths to avoid excessive shrinkage and beetles, which otherwise eat horns away from the base. The hoofs mounted in silver make delightful and unique ashtrays (half a hoof well dried and polished), I have a couple which are the envy of all who see them.

Reading through these notes I find that I have commented rather freely on the charging habits of wild buffalo. Naturally I remember best the shoots that were more exciting, but on the whole with our modern rifles I do not think that shooting wild buffalo is any more dangerous than pig-sticking or following up a wounded tiger. In nine cases out of ten the bull is dead before he realises what is happening. It is the tenth case, when following up a wounded beast, or one that has had a slug in him from some cultivator's gun, that produces the incidents and occasional accident. I did hear that a couple of sportsmen had been injured during previous years, and in both cases they were entirely to blame for using shot-guns or rifles totally inadequate for the purpose. One man who was using I think a .280 Ross got a couple of ribs and a leg smashed. I consider he was lucky to get away alive.

As regards how buffalo charge, in dense cover there is usually no time to note particulars. All one sees is an immense head and horns, accompanied by fearful crashing in the thickets at a distance of 5 or 6 yards. If your luck is in he passes to your front, if not and he faces you I really cannot advise you how to manage, I usually dive behind the nearest cover and let him have a shot when he pulls up in indecision before making up his mind to follow you. I can speak with greater certainty as to how they charge elephants, as I have on three occasions been charged or seen another charged. In each case there was a preliminary grunt, low and subdued, followed by a trot with the nose up, horns well back across the neck. The horns were only lowered when about 10 yards distant from the elephant, when the trot was changed to a series of bounds. The actual strike with the horns was made with a sideways sweep. I have seen an elephant horribly gored in the region of the stomach, the horn penetrating some 8 or 10 inches. This was a case where a cow sitting in high grass absolutely jumped up at the elephant, the elephant fled being pursued by the cow who gave her a good shove behind whenever possible.

These preserved jungles were very fine, one could moon round looking at buffalo and taking photographs, if not actually shooting, whilst mighty boar and fine heavy hog-deer kept the senses sufficiently alert to fully appreciate the snap-shooting practice one used to indulge in as a light-horseman in the Volunteers. It was a delight to slay Mugger. These ugly brutes were in every swamp and creek, and grew to immense size—17 feet in length being the biggest we ever got. The number of brass and copper bangles and anklets we got out of their stomachs surely couldn't have come from corpses only. Gharial or long snouted crocodile also went to great length in the Kosi streams; the biggest we ever got was nearly 23 feet from the tip of his snout to the end of his tail, the lumps on his nose were as big as saucers: this brute also disillusioned me as to this type being purely fish-eaters, as when cut open we took out of him a child's thigh bones complete with silver bangles as well as a flattened brass 'Lota'. In addition small game of all descriptions was to be had with little or no trouble, snipe, teal, black and swamp partridge, quail, peafowl, and an occasional florican (Lik or lesser species). Storks, waders and kindred non-sporting birds were in their legions in every swamp, whilst in the paddy-fields the wary Koolung or Demoiselle Crane could be stalked and bagged for the pot with the light rifle.

Measurements recorded are as follows:—

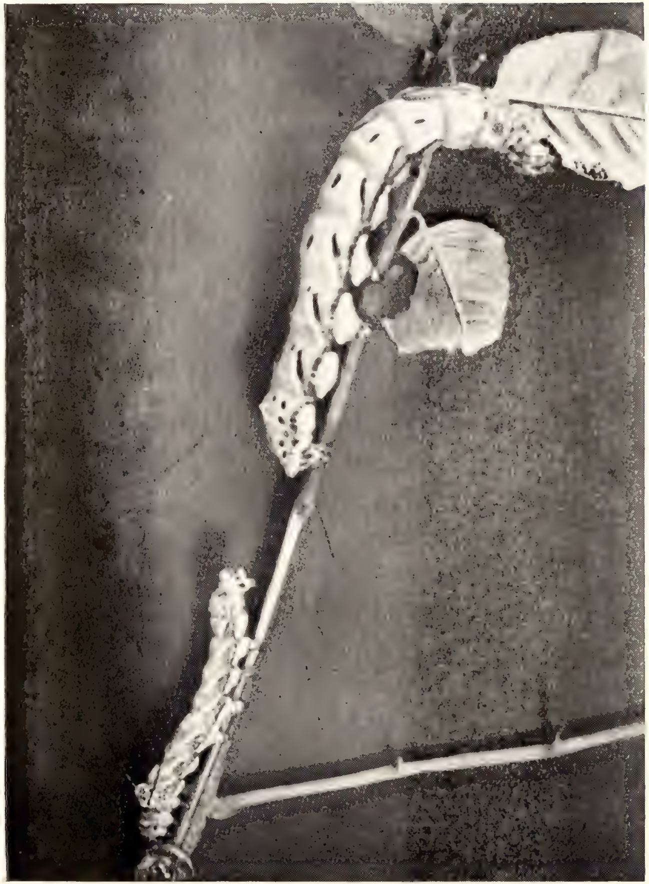
A. Big Bull Buffalo with self just after being shot, horn sweep 109 inches, girth 19¾ inches. Height after being properly laid out 68 inches.

B. The Rogue Buffalo, horn sweep 96 inches, girth 17¼ inches.

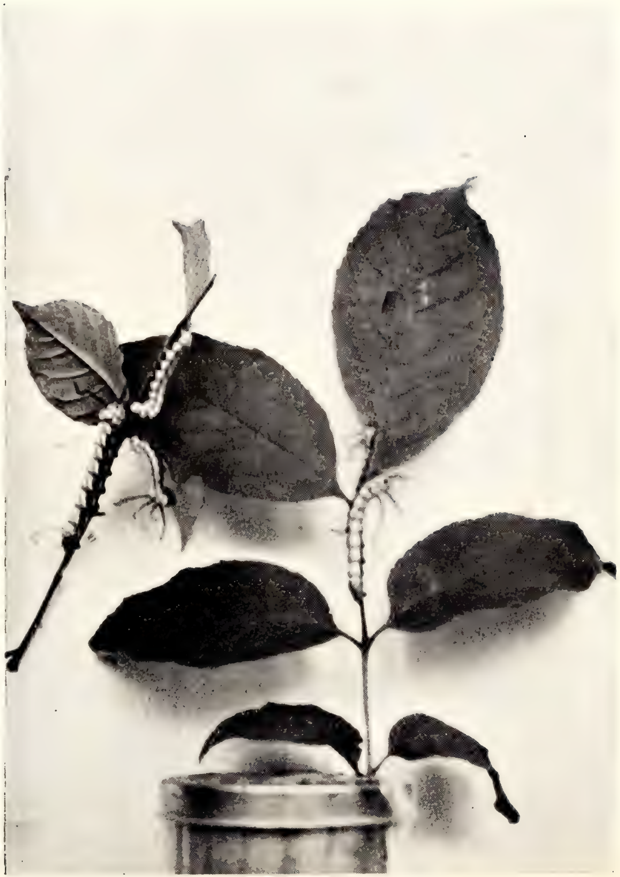
C. Cow, sweep 112 inches, girth 13 inches, tip to tip 49 inches.

To anybody wanting expert information on the Wild Buffalo, I can recommend J. D. Inverarity's excellent article in the Bombay Natural History Society's *Journal*, vol. x, No. 1, of 10th November 1895.

For Wild Buffalo Shikar I think Assam is the only province where the average shikari of moderate means can meet with any success, though even there I should think that anything over 108 inches in sweep is rare.



A. Larvae Nos. 2 and 5 of *Brahmea wallichii*, rather less than full size.



B. All five larvae of *Brahmea wallichii* on ash-twigs.

THE LIFE-HISTORY FROM EGG TO PUPA OF *BRAHMEA WALLICHII* GRAY.

BY

MAJOR J. A. GRAHAM, R.E.,

Headquarters, Meerut District, Dehra Dun.

(*With* 2 *plates and* 4 *text-figures*).

Having had the opportunity to rear some larvae ex-ovo, the following details of this peculiar species may be of interest to lepidopterists—more especially as I am informed that the life-history is not known.

At Naini Tal on June 27th 1935 I received from a friend a female *Brahmeid* moth, which during its incarceration in a cardboard box had deposited 37 ova. The moth was so worn as to be worthless as a cabinet specimen, and it was released on the trellis-work of the bungalow verandah, over which was growing common honeysuckle. Next morning 10 more eggs were found on the trellis where the moth had been placed.

Ovum.—The egg is almost three-quarters spherical, on a flat base, and very slightly depressed at the distinct dark grey micropyle; colour pale yellow, darker tinged near summit; diameter 2.5 mm., height 1.8 mm. On the eighth day the colour is grey with a deep brick-red area round the summit. On the tenth day the head and black and grey colouring of the larva inside are plainly discernible; the larvae hatched on July 8th, the eleventh day from deposition of ova.

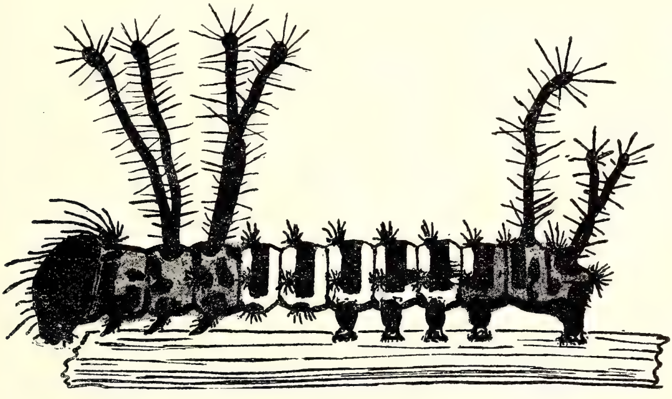


Fig. 1a. Larva of *B. wallichii.* × about 10.
Side view, 36 hours old. Length 7.0 mm.

Larva.—On emergence the first meal is the egg-shell; some eat practically all, some have only a few nibbles. The larvae present a most peculiar appearance, and look much too big for the shell they emerge from (Fig. 1a.). Length at 36 hours of age is 7.0 mm., and the longest fleshy protuberance or 'tentacle' is about 3.25 mm. The general colour is greyish white with black transverse bars, and yellow with black markings on the first three and last two somites, the 'tentacles' being black.

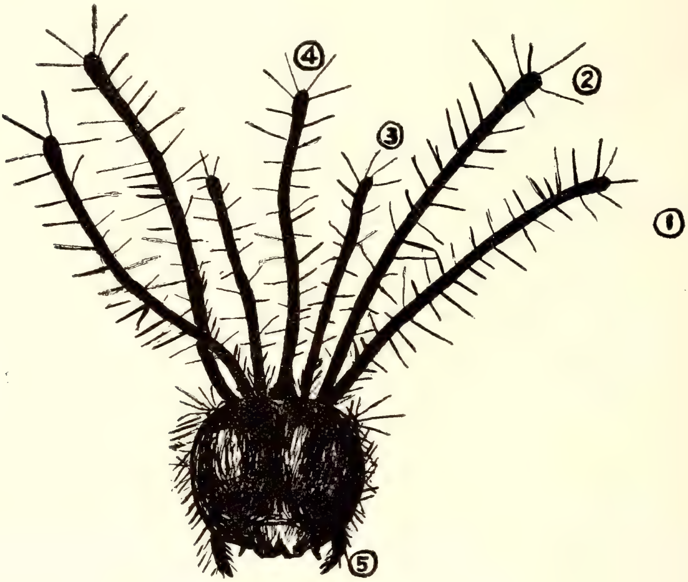


Fig. 1b. Front view of larva of *B. wallichii*. × about 15.

(1) 2nd somital pair of 'tentacles'. (2) 3rd somital pair. (3) Anal somital pair. (4) Anal somital (single). (5) 1st pair of true legs.

During the next four days nineteen different trees and shrubs and several creepers were tried as food-plants without success; in consequence all the young larvae died of starvation except five which at last began to feed on a species of Ash (*Fraxinus macrocantha*).

On July 14th the two larger larvae were 14 mm. long, and very plump, so that the head was relatively small; the second and third somites were pale yellow and swollen. These two larvae completed their first moult between 8 p.m. and 12-30 a.m. on the night of July 15th-16th. The moulting position for all moults is on the underside central rib of a leaf or of the leaf-stalk, preferably head downwards.

The remainder of this account deals chiefly with the history of the largest larva as typical.

Fig. 2 shows the changes that result from the first moult. The black bars are reduced to two longitudinal marks per somite, the sublateral and ventral surfaces are yellow, and each somital joint is tinged with yellow. All the bristles on the 'tentacles' have gone, and the latter are much longer, peculiarly bent and kinked, and shiny black; the 'tentacles' are not moveable except in a general fore and aft direction by movement of the skin at their points of attachment. All warts except one small anal one have also disappeared. The alarmed attitude is very similar to that of a *Sphinx ligustri* larva, but the head is even more recurved as it touches the sixth somite.

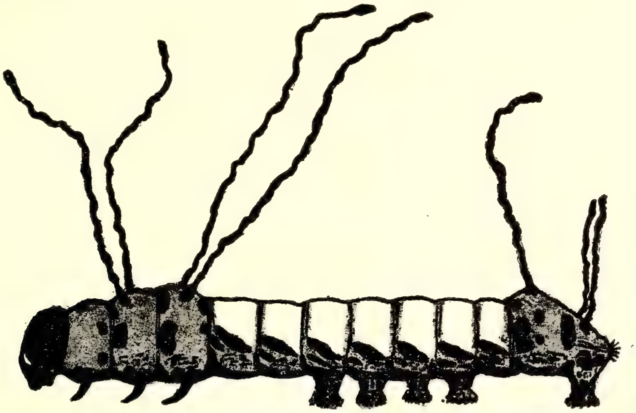


Fig. 2. Side view of larva of *B. wallichii*. × about 5. In 2nd instar. Aged 8 days; length 16 mm.

On July 19th the larva was 20.5 mm. long and preparing for its second moult, which took place early a.m. 20th. By 6 p.m. on this date the length was 24 mm.; the first pair of 'tentacles' 12 mm., second pair 14 mm., single anal one 7.5 mm., and anal pair 5 mm. Thickness of larger pair about 0.2 mm. The head is now marked with black bars on a greenish yellow ground (Fig. 3). Body markings are as previously except that the each lateral and sublateral ones are finer. The sublateral portion of each somite is somewhat folded and wrinkled.

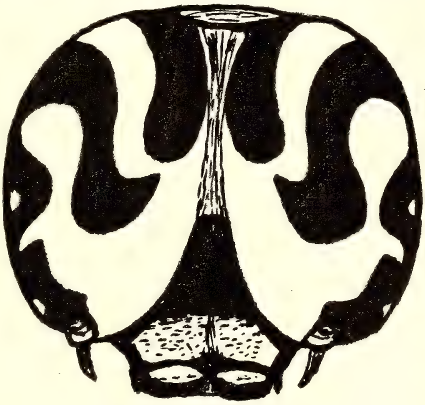


Fig. 3. Head of *B. wallichii*, × about 20. in 3rd instar.

The third larva was watched whilst moulting between 9-10 and 9-25 p.m. on July 21st. On emergence from the old skin, the head is like an unripe maize-grain, and the tentacles like irregular bits of greenish glass-thread; whilst drawing itself out of the skin the tentacles can be seen folded flat along the dorsum reaching to about the tenth somite. They are apparently not connected in any way with the old tentacles which are shed complete on the old skin. When the last somite is withdrawn by one or two jerks of the body, the larva uses its jaws to free the three anal tentacles from each other as they are more or less stuck together.

The head markings and tentacles of this larva were fully black by 10-30 p.m., about an hour after moulting.

On July 23rd the largest larva was 31 mm. long and preparing for its third moult. The tentacles do not increase in length or thickness with body growth during each instar.

The third moult occurred about 10-30 p.m. on July 24th. The only appreciable alteration in markings is that the sublateral black markings are wider and the intersomital joints more yellow. At 4 p.m. on July 25th this larva was 34 mm. long. The tentacles seem to have been damaged during withdrawal, as their lengths are now:—

1st pair right, 10 mm.; left, 18 mm.; 2nd pair right, 24 mm.; left, 17 mm.; anal single, 13 mm.; anal pair, 6 mm. each and slender.

The last 3 mm. of the anal single one is re-curved posteriorly like a hook.

When the second larva moulted for the third time, the tentacles also varied in lengths as below:—

1st pair right, 9 mm.; left, 17 mm.; 2nd pair right, 23 mm.; left, 24 mm.; anal single, 13 mm.; anal pair, 7 mm.

Plate II gives an impression of the front view of a larva in third and fourth instar in the alarmed position. The head is bent down in between the foremost pair of prolegs which are raised from the stalk on which the caterpillar is resting.

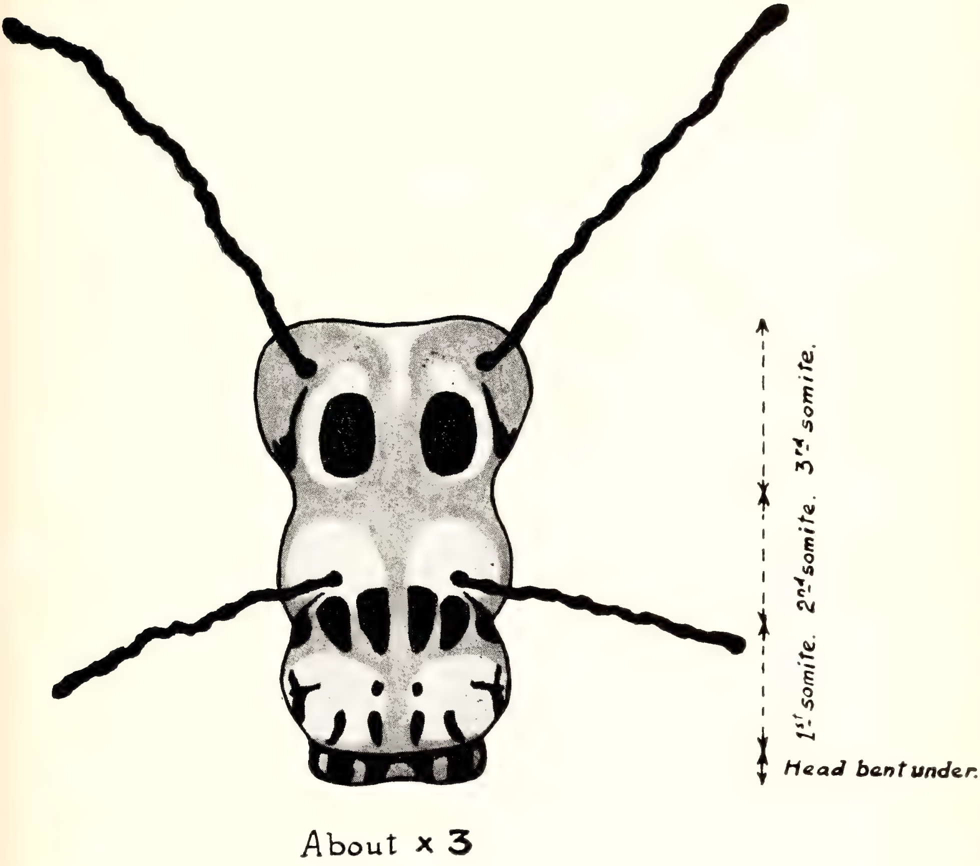
On July 27th the largest larva was 54 mm. long, average thickness of body 7 mm. Twelve hours later its length was 61 mm. The skin is now very smooth, shiny and well filled out. Plate IB shows the five larvae on food-plant.

On July 29th this larva prepared for its last moult, which occurred between 3 p.m. and 5 p.m. on July 31st. The head markings did not get fully black till about 7-30 p.m.

In this last instar the seven tentacles are completely shed; on the second and third somites they are replaced by oval-shaped chalk-white marks with a tiny wart in the centre, on a dirty olive-green ground. The lateral markings on first three somites are now fine black reticulations filled in with white. The third somite is double-humped and has a pair of large chestnut-coloured spots posteriorly, with black centres.

Somites 5 to 10 have a dorsal black cigar-shaped mark, and two small black dots anteriorly. On the anal somite there is no trace of the single tentacle, but a prominent hump with a blunt point; the posterior half has black spots where the last pair of tentacles were; the vent is surmounted by a triangular anal plate tipped with black. The ventral surface is dirty brownish with a medial black stripe and edged by the black sublateral lines which are much thicker.

Plate IA. taken on August 8th, shows the second largest larva in the last instar together with the smallest, which was rather a weakling, in its fourth instar one month after hatching.


3rd somite.
2nd somite.
1st somite.
Head bent under.
About × 3

Front view of larva, 4th instar, in alarmed position.

On August 7th the largest larva, now 110 mm. long had changed its dorsal colouring to dull orange—obviously preparatory to pupating, as it was restless. An assortment of soil, stones, twigs, moss and bark was provided for pupation, but was not received with gratitude, and the larva duly pupated on August 13th on the floor of the breeding cage under a loose piece of bark.

The third larva attained a length of 114 mm. when full-grown.

The pupa is deep brownish black, naked, cylindrical, smooth but not shiny; length 44 mm. exclusive of anal spike which is strong, 4 mm. long and furnished with two small sharp points about .75 mm. long; diameter at lower edge of wing cases 14 mm.; at the base of the thoracic plate is a curious raised transverse feature, with a double pit or indentation centrally and a small pit at each side. Segments 8 and 9 have small knobs in the positions of the old prolegs.

None of the other larvae made any use of the materials supplied for pupation, and it is regretted that no notes can be given of their natural pupation habits.

After moulting the larvae must eat the old skin, as no traces were found after any moult (other than the fourth) except the head and bits of the old tentacles.

The appetite is enormous, and it is of interest that although by no means lethargic, the larvae do not wander, but prefer to remain on a particular twig until all available leaves and stalks are consumed. A move is then made to the next nearest twig providing a meal.

In conclusion, the following table gives the average periods for the various changes from deposition of egg to pupation.

Period in ovo	10½ days	Average total 50 days.
,, to 1st moult	8½ ,,	
,, to 2nd ,, ...	4 ,,	
,, to 3rd ,, ...	6 ,,	
,, to 4th ,, ...	7 ,,	
,, to pupation	14 ,,	

A FISHING TRIP IN KUMAON.

BY

A. St. J. Macdonald.

(*With two plates*).

Assuming that anglers like myself scan the papers for new and up-to-date information of rivers to spend a fishing holiday on, I am writing this note of my recent trip up the Kali, Sarju, and Eastern Ramganga rivers in Kumaon. There is much which needs adjustment in Skene Dhu's book, in both the fishing water and the route to be followed. I worked the Kali or Sarda from Tanakpur to Pacheshwar, where the Sarju joins and up the Sarju to above Kapkote on the Pindari Glacier road, then over the Sema Pass to Tejam and down the Ramganga to Rameshwar where it joins the Sarju a distance of 280 miles of fishing water. In all this stretch of water the rivers need only be left in four places, and worked along above by village paths or roads. If given time, the water can be approached at certain points if one is prepared to descend and climb a few hundred feet. Kit can be carried along the rivers by Dhutials without whom it would be impossible to undertake the trip. The local Pahari or Kumaonee would let one down and ask extortionate wages. It must not be presumed by these notes that it is an easy matter to follow up the river-bed. Much boulder stepping and climbing is necessary to get by land-slides and cliffs, and in some places difficult wading from one bank to the other, but as long as marches are kept to five and six miles over the difficult stretches, the water can almost all be fished and good sport obtained.

In the two months I spent on my holiday, I had fifty fishing days and caught with another rod (which was with me for a time only and fished only a couple of hours a day) 117 fish = 946 lbs., over an average of 8 lbs. Five best fish scaled 96, 40, 36, 30 and 29 lbs. The best bag in one day was 16 fish to my own rod, and the best weight in a day was 117 lbs. for 8 fish, with Fly Rod. The best day was 16 fish = 52 lbs., best 6½ lbs.

From Tanakpur one can follow the Kali to Chuka where the Ladaya joins 21 miles. From two miles above Chuka one must leave the river and climb over the ridge, a stiff climb of 5,700 ft. to a village on the top, Dabangaon—a distance of six miles. Camp here on the north side, and if the weather is fine, an excellent view of the snows can be had. From here march to Gurmacktashwar (14 miles). A dull march over open slopes and then a steep descent for the last two miles. The Loha Ghat stream joins in here. The river from here can be followed to above Kapkote and no further difficulty is experienced till below Tejam to Thal on the Ramganga. There is a wonderful gorge here, which must hold monsters, but it wants to be worked very

A morning's catch at the junction of the Ladaya with the Kali.

The junction at Pacheshwar showing the Temple Rock: the saviour of many a monster. My line was cut through 3 times in a day.

A typical gorge on the Ramganga below Aulaghat, and a natural sanctuary for fish.

Big water with big fellows. I lost here a fish which left behind a scale $3\frac{1}{4}$ in. in diameter.

thoroughly and in small stretches. The D.B. road is 600 ft. or so above the river, and much climbing is necessary to get to and from good water. The river is again difficult at a point below Thal at Munipani where it enters a gorge and is impossible for a mile or so, but the path along the right bank keeps near and above the river which can be approached in some places. From here to Aulaghat, water is good and can be worked to a point just below. Here again is a gorge, but a path leads along the face of a precipice for three miles and is but a few inches wide and takes time for the coolies to negotiate with loads. A false step or slipping stone would end in disaster several hundreds of feet below. The path should only be attempted if one has a good head for heights. From it is only eleven miles to Rameshwar. Intermediate water is excellent and can be approached anywhere provided one is prepared for heavy work in descending and climbing. These gorges are the saviour of the fish. They serve as sanctuaries, and are still unmolested by the hand of man. Wild and well forested they are the few remaining landmarks of the Kumaon of long years ago. This note read with Skene Dhu's book gives an idea of the rivers as they are today and the route to follow.

To those unacquainted with these rivers a note on tackle will be of interest. A ten-foot spinning rod and fly rod with wire traces for spinning and gut for fly spoon work meets one's outfit. The water is gin clear and the river small, so that unless one's tackle is of the finest, few fish will be caught. Spoon does not meet with success and Chilwa (or rather small fish for I never saw a Chilwa in the rivers) is far the most killing in the Sarju. Spoon is killing in the Ramganga. A small net is necessary for catching small bait and 150 yds. of line, ample. Like all Himalayan rivers the snags and rocks are sharp-edged and cut through gut or one's line like a knife. Killen wire is the best form of wire for traces and can be made up in a few moments. The places to fish are the same as in all rivers, in and below rapids or at the end of pools above rapids. The best time appears to be from the time the sun gets on to the water until it leaves it in the evening. Early morning and late evening did not meet with much success, and I found, once the fish started to rise after the sun left the water, it was useless continuing. Cloudy, rainy, and sunny days all gave good and bad sport so I would not speak for or against weather conditions. I think, for Mahseer anyway, the only element that matters is the water, and exactly how remains a problem to be solved. Fly spoon $\frac{1}{2}$ an inch, I found better than any other size and gilt and silver seems to take best. At burning ghats, huge fish are to be seen cruising about but not to be tempted with either spoon or small fish. Atta I tried without luck, and meat if it can be obtained will provide a run or two, but the idea is repulsive, as anyone who has visited these waters will know. The moment a corpse is released the water is alive with corpse eating fish from 60 lbs. downwards. I tried a black and red spoon on these fish to try and represent their fancied though depraved taste, but met with no success. It is a waste of time fishing at these places as good fish are to be taken in the rapids above and below gorges where the country is wild and unmolested. Supplies like atta, rice, milk and ghee, are to be had in most villages. Fowls and eggs are scarce and expensive, so that a certain amount of tinned provisions, are necessary.

A few general remarks on shooting and the state of the country, may be of interest. In this connection I can only paint a picture of gloom. The fish are poached from end to end, from Pacheswar to Kapkote on the Sarju, and Tejam on the Ramganga. Fish traps, nets, spears and weirs to divert the water and leave the fish high and dry, for easy capture, are in great evidence. I have seen baskets of young Mahseer caught in this way by three or four children, so that with the colonising of the valleys, the destiny of these rivers for sport is gloomy, unless some enquiries are made and protection is enforced by the Civil Administration. A much more curious feature is that none of the commoner fishes of the Indian rivers are to be seen. *Rohu*, *Kalbash*, *Bowali*, *Tengra*, *Butchwa*, *Chilwa* and the other Carps are all missing. I examined baskets of fish and in such clear water it is easy to pick out the fish in variety. The local people attribute this to the Sarda canal headworks at Bombassa, whether this is a fact or not, it is one calling for investigation and immediate adjustment, if these rivers are to remain the fishing waters they are attributed to be. Game by the river is scarce, and it is pathetic to see Gooral, Muntjac, and Koklass pheasants down by the rivers in May because of the fires on the hills, which have driven them down for safety. The fire season is from April till the rains break, and hardly a hill side escapes unless it is a Regeneration Reserve for Cheer Pine. The damage to bird life (nesting at this time), insect life and the subsequent destruction of creatures which are driven down to the rivers and make easy prey for the numerous *Bundook Wallahs*, is deplorable. While fishing, I have on three occasions had Gooral on the opposite bank, within easy range of a shot gun. The haze caused by these fires is like a cloudy day, or the western sky in the plains when the Loo is at its height.

This is the Kumaon of today and unless a commission which includes experts in Ornithology, Pisciculture, and Entomology, are soon appointed to adjust this state of affairs, there will be little left but the terraced labours of man, and the dry springs of administration. And the day is in sight when there will be no fuel or or water available to provide for the ancient rights of the Sons of India.

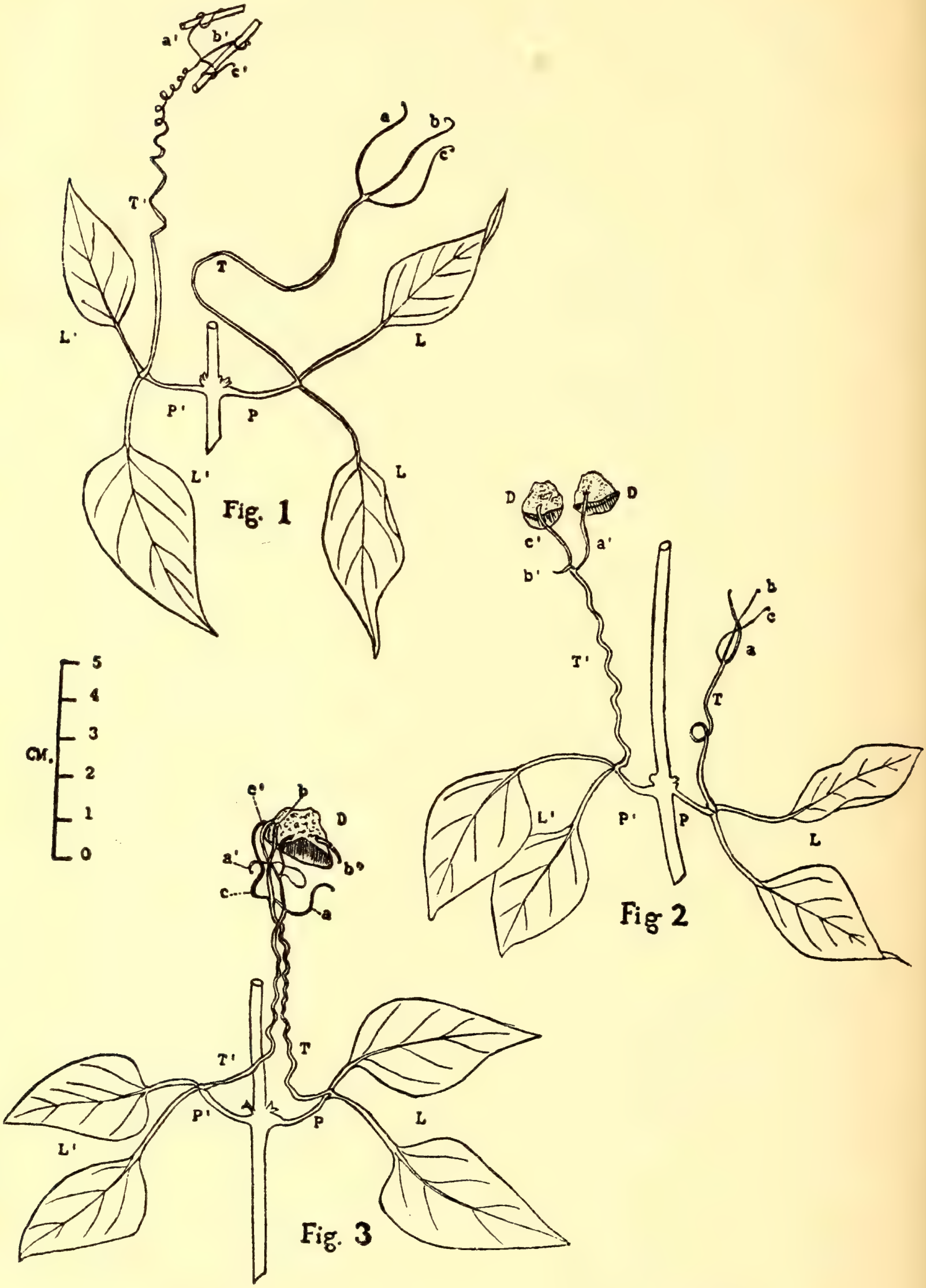

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Fig. 3

Adhesive tendrils in *Bignonia venusta* Ker.-Gawl.

(*For explanation of figures see end of article*).

ON THE OCCURRENCE OF ADHESIVE TENDRILS IN *BIGNONIA VENUSTA* KER-GAWL.

BY

J. F. R. D'ALMEIDA, B.A., M.SC.

(*Professor of Botany, St. Xavier's College, Bombay*).

(*With one plate*).

The formation in consequence of mechanical irritation of cellular outgrowths in the shape of 'discs', 'balls', 'pads' or 'suckers' on tendrils by means of which they attach themselves to rocks, walls, the bark of trees or other similar supports has been the subject of investigation by various writers, and Darwin (1), Göebel (3), Kerner and Oliver (4), and Pfeffer (10) cite several instances of such tendrils.

Amongst the AMPELIDACEAE adhesive tendrils have been observed in *Vitis hederacea* Ehrh. (= *V. quinquefolia* Lam., *Ampelopsis hederacea* DC., *A. quinquefolia* Michx., *Psedera quinquefolia* Greene, *Hedera quinquefolia* Linn.) (1), (4), (7), *V. inconstans* Miq. (= *Ampelopsis Veitchii* Hort., *A. tricuspidata* Sieb. & Zucc., *Psedera tricuspidata* Rehder) (4), (6), *V. capreolata* D. Don (= *V. Royleana* Hort.) (4), *V. ternata* Baker (= *Cissus paulinifolia* Vell.) (10), and *V. assamica* M. Laws (11). The tendrils of most CUCURBITACEAE show a certain proliferation of the epidermal and cortical cells and in *Sicyos angulata* Linn. and a few other Cucurbitaceae the fixation is aided by a viscid secretion (8), (10), whilst in *Hanburia mexicana* Seem. (1), (3), (4), (10), *Peponopsis adhaerens* Naud. (3), (9), *Gymnopetalum cochinchinense* Kurz (11), and *Trichosanthes pubera* Blume (= *T. palmata* Roxb.) (11) structures analogous to adhesive discs are formed. Similar outgrowths have also been observed in the BIGNONIACEAE, for instance, *Bignonia capreolata* Linn. (1), (3), (4), (10), *B. littoralis* H. B. & K. (1), (3), (4), (10), *Amphilophium Mutisii* H. B. & K. (= *Amphilobium Mutisii* Loud.) (10); and *Aplolophium* Cham. (= *Haplolophium* Endl.) (2). To this list it is proposed to add *Bignonia venusta* Ker-Gawl. whose tendrils the present writer has observed occasionally to produce similar adhesive masses, but before we proceed to deal with these it will be well to state a few facts known about these peculiar outgrowths in the plants that have already come under the observation of previous investigators.

Von Mohl was the first to show that such adhesive structures appear in response to the stimulus of contact with a firm body (6). They are usually formed by outgrowths from the epidermal cells and subjacent parenchyma, and they secure a firm hold of the support by growing into the irregularities of its surface and secreting a sticky substance or cement which completes the attachment (1), (4), (5), (10). Adhesive tendrils either require the stimulus of contact for the first development of their discs, e.g. *Vitis hederacea* (1), (4), (10); *V. capreolata* (4); *Bignonia capreolata* (1), (4); *B. littoralis* (1), (4); and *Amphilophium Mutisii* (10); or the suckers are pre-formed structures present as small swellings at the tips of the branched tendrils, and are simply excited to further development by contact. e.g. *Vitis inconstans* (1), (4), (8); *V. ternata* (10); and *Aplolophium* (1), (2), (3). Adhesive tendrils, though they all seem to agree more or less in being negatively heliotropic, i.e. in inclining away from light, show their predilection for a particular substratum. Some, like *Vitis hederacea* and *V. inconstans*, can climb up smooth walls and even planed wood, glass, and smooth polished iron, and form their discs upon these surfaces. Others like *Bignonia capreolata* require rough uneven surfaces, and seek crevices and crannies of stem and bark, and actually creep into them and there swell out into a club or ball and sometimes even fill up the cracks (1), (4).

Darwin (1) has given a pretty elaborate account of the tendrils of *Bignonia venusta*. They are modifications of leaves (Fig. 1). Each leaf consists of a petiole (P, P') with two lateral leaflets (LL, L'L') and ends in a tendril which is formed by the metamorphosis of the three terminal leaflets. Like the tendrils of *Bignonia unguis-cati* Linn. and some other Bignonias it has a fanciful resemblance to the leg and foot of a small bird. 'The lower part, or tarsus (T, T') is four times as long as the three toes (a, b, c and a', b', c'); these are of equal length and diverge equally, but do not lie in the same plane; their tips are bluntly hooked, and the whole tendril makes an excellent grapnel' (1). Kerner and Oliver (4) liken the claws at the ends of the delicate tendrils to those of insects' feet. Darwin also describes the manner in which the tendril seizes the support, but, it seems, his observations are restricted only to instances in which the tendril seizes an object which it can clasp by twining round it, for he makes no mention whatsoever of the peculiar cellular outgrowths or cushions which the present writer has seen to be produced on the tendrils under certain circumstances. The author's attention was first drawn to these structures by accident on a plant which was growing on the venetianed verandah of his residence. The climber had been trained some distance up the outer side of the verandah on a frame-work of thin wire. Higher up it was left to find its own way. In a short time some of the branches grew inwards into the verandah through the venetian blinds. On an examination of these inwardly growing branches a number of irregularly-shaped pads or cushions about 10-15 mm. in diameter and 6-8 mm. in thickness and of a creamy colour slightly tinged with green were noticed at the ends of the tendrils (Figs. 2 and 3, D). These masses adhered firmly, as if cemented, to the inner angles of the venetian shutters and looked like wax which had been poured round the edges of the slips of wood composing the blind and had solidified. On a further investigation it was found that some of the tendrils that had crept into the crevices of the venetian woodwork also showed a development of a similar tissue so that they could not be readily withdrawn, and, where the tendrils clasped a split bamboo post which presented many projecting points and fibres and fine crevices, the hooked ends developed into small irregular discs 1-2 mm. in diameter which adhered firmly to the rough surface of the post.

The adhesive pads of *Bignonia venusta* may appear separately on each of the three branches of the tendril should each of these meet with the requisite type of support (Fig. 2), or the outgrowths of branches (toes) of a single tendril or of two distinct tendrils may unite in a single mass (Fig. 3). Should a tendril or any of its branches not meet with a support it dwindles down and dies. But such free tendrils or their branches are frequently found embedded in the adhesive pads produced by a neighbouring tendril or branch of tendril (Fig. 3, b). Such encased tendrils can often be recognized by the hooked tips which may be seen projecting beyond the pad and which show no indication of swelling. There is reason to believe that the tendency to form pads is not restricted only to that branch of the tendril which meets with the type of support calculated to cause the development of the adhesive masses, but the stimulus to form such masses is transmitted to the other branches of the tendril which also develop similar outgrowths on clasping supports, such as wire, tendrils, stems, etc., which do not ordinarily cause the formation of adhesive pads. As regards their tropisms, observation points to the fact that the tendrils of *Bignonia venusta* are not negatively heliotropic as are the adhesive tendrils of most of the other plants mentioned herein. They have been seen to point indifferently in all directions irrespective of the source of the illumination. In regard to the type of support suitable for the formation of adhesive cushions or pads it is obvious from the foregoing that bodies presenting a surface with a certain degree of roughness can stimulate the formation of pads. Smooth walls, window panes and similar surfaces seem to produce no impression whatsoever on the tendrils which have been seen to droop and die in spite of being in constant contact with these surfaces, unless, however, they come across a support which they may clasp.

To summarize:—

Adhesive tendrils have so far been definitely known to be produced in the following plants:—

AMPELIDACEAE:—	*Vitis hederacea* Ehrh., *V. inconstans* Miq., *V. capreolata* D. Don., *V. ternata* Baker, *V. assamica* M. Laws.

CUCURBITACEAE: —	*Sicyos angulata* Linn., *Hanburia mexicana* Seem, *Trichosanthes pubera* Blume, *Peponopsis adhaerens* Naud., *Gymnopetalum cochinchinense* Kurz.
BIGNONIACEAE: —	*Bignonia capreolata* Linn., *B. littoralis* H. B. & K., *B. venusta* Ker-Gawl., *Amphilophium Mutisii* H. B. & K., *Aplolophium* (Cham.) *sp.*

The tendrils of *Bignonia venusta* behave like ordinary tendrils when they come across supports which they can readily clasp—sticks, wire, etc. They form adhesive cushions, however, on contact with a body presenting a somewhat rough surface. The stimulus to form adhesive structures seems to be transmitted from branch to branch of a tendril. The inclination of the tendrils is independent of the direction of the light.

The writer's thanks are due to the Rev. Fr. J. F. Caius, S.J., of St. Xavier's College, Bombay, for his kind help in determining the synonymy of the plants mentioned in the paper, and for his valuable suggestions which have been embodied herein.

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EXPLANATION OF FIGURES.

Fig. 1.—Portion of a branch of *Bignonia venusta* Ker-Gawl. showing two opposite leaves and their tendrilar prolongations. P,P', petiole; LL'L'L', lateral leaflets; TT', tarsus; a,b.c,a'b'c', toes.

Fig. 2.—Portion of a branch of *Bignonia venusta* Ker-Gawl. the development of adhesive pads D, from two branches (a' & c') of a tendril. The rest of the lettering as in Fig. 1.

Fig. 3.—Portion of a branch of *Bignonia venusta* Ker-Gawl. showing union into a single mass (D) of outgrowths of the branches of two opposite tendrils. Lettering as in Fig. 1.

REVIEWS.

I. AN ABRIDGED CATALOGUE OF CERTAIN SCUTELLEROIDEA (*PLATASPIDAE, SCUTELLERIDAE* AND *PENTATOMIDAE*) OF CHINA, CHOSEN, INDO-CHINA, AND TAIWAN. By W. E. HOFFMANN, Lingnan University Bulletin, No. 7 (1935).

The Catalogue of the Rhynchotan order Scutelleroidea by Dr. W. E. Hoffmann contains an admirably arranged list of genera and species of China and the neighbouring faunal subregions. It is an enlarged edition, with a great deal of additional material of the check list of the order published by the author in 1932. In 1909, Kirkaldy compiled a complete list of the World fauna of the group. Hoffmann's Catalogue makes an addition of 11 genera, 86 species and 12 varieties to Kirkaldy's list of 142 genera, 362 species and 20 varieties recorded from this region. To make the list as complete and up-to-date as possible, the author found it necessary to include two chapters of 'Additional species' and 'Addenda and Corrigenda' in the Bulletin. Throughout the catalogue he has followed a uniform method of arranging the genera phylogenetically and the species alphabetically following Kirkaldy's catalogue. As earlier literature is all listed in Kirkaldy's catalogue, Hoffmann has mainly confined the literature citations to works published after 1909. The geographical distribution of the various species is given in great detail. The 'Alphabetical list of genera and species' in conjunction with the 'Index to the genera, species and varieties' published at the end of the volume facilitates the location of different species, more particularly as the old names and synonyms are also indexed.

The very useful annotations added to the detailed bibliography fully define the exact scope of the different papers, monographs, catalogues, etc. and should enable students consulting the catalogue to determine the value of various references.

Appendices I and II contain notes on Faunal Sub-regions of Eastern Asia with special reference to China, and remarks on the Zoogeographical items with the aid of maps and the alphabetical list of about 600 place-names in Eastern Asia classified into general sub-regions, should prove very useful for workers in understanding the distribution of the species of the group; this is of special value as the names of many places, in China particularly, are not easy to find on maps that are generally available to most workers.

A cursory glance through the list of species shows the large number of species which are common both to India and China, and as the last volume of Distant in the *Fauna of British India* series was published in 1918 the present catalogue should prove very helpful to workers in India.

B. P.

II. THE SNAKES OF INDIA. By K. G. GHARPUREY, I.M.S. Demy 8vo. Pp. x+165; 29 diagrams, 52 illustrations. (The Popular Book Depot, Bombay) 1935. Price, Rs. 3.

It often happened in the past that in aristocratic families the eldest son was a kind of privileged being, whose future was being carefully planned and at times entailed sacrifices which were bound to affect his younger brothers who were supposed to shift for themselves. A similar spirit of favouritism obtains even nowadays among the scientific brotherhood, whose members write for their fellow-scientists and apparently do not care for those unfortunates who belong to the unscientific crowd! Hence the author is to be congratulated on having produced a popular book giving general information and useful knowledge about the various common snakes of India. Scientists may perhaps object that the book could have been written on other lines; but, if they do so, they lose sight of the author's aim which is essentially pragmatic—to let knowledge reach as many persons as possible. Accordingly the book has been priced at Rs. 3, which is a record-breaking low price for an illustrated book on snakes.

The author himself tells us that there is hardly anything original in this book and that the information it contains has been collected from divers sources and put together without its being made too technical. But if the book is not original in this sense of the word, it is nevertheless an interesting production which well fulfils the purpose intended.

The opening chapter gives general information about snakes, and is followed by a short note on animals confused with snakes—an excellent idea this. Various points, such as Teeth and Poison-glands, Snake Poison, Scales on a Snake, Classification of Snakes, Identification of Snakes, Protection against Snakes, Treatment for Snake-bite, are dealt with separately and form the subject of as many short chapters. By far the greater part of the book is devoted to the description of Indian Snakes. All through the style is simple without being obscure, and the matter is condensed without being jejune.

It may be noted that *serpens* is Latin, not French, and that *kattuvirian* is the Tamil for the Indian Krait and not for the Echis which is known as *suruttaippambu*.

In the reviewer's opinion it is regrettable that the author should on several occasions have made use of the word 'variety' instead of 'species'. The two words are not synonymous, and *species* is such a common word that it cannot be objected to in a popular book not strictly scientific.

J. F. C.

III. THE NIDIFICATION OF BIRDS OF THE INDIAN EMPIRE. By E. C. STUART BAKER, C.I.E., O.B.E., F.Z.S. Vol. IV (Taylor & Francis, 30/-).

It is with mixed feelings that one sits down to write the review upon this, the concluding volume, of Mr. Stuart Baker's great work, for to the reader, no less than to the author, there must always be a certain feeling of sadness when the word 'Finis' comes to be written.

On the other hand, it is a matter of supreme satisfaction that the final word has been written by Mr. Stuart Baker's own hand, and that he has been spared to place the coping stone upon the edifice, the foundations of which he laid half a century ago.

In tendering him our hearty congratulations, may we also add that it is characteristic of the author, and of his devotion to the cause of Ornithology, that he kept to the last the writing of this work which, one feels, has always been nearest and dearest to his heart.

For in addition to his innumerable contributions to Ornithology in the pages of *The Bombay Natural History Journal*, *The Ibis,* and elsewhere, and his volumes on the Indian Ducks, Pigeons, and Game Birds, it was not until he had completed his masterly revision of the Birds of the Indian Empire in the *Fauna of British India* series, that he embarked upon the work under review, which he has now brought to a successful conclusion.

In his preface to Vol. IV, Mr. Stuart Baker tells us that the *Fauna* deals with no less than 2,351 species and sub-species, of which the breeding of 1,723 species and sub-species is recorded in the present volumes. Of the residue, 349 are known to breed in countries outside the Indian Empire and Ceylon, whilst there remain 279 concerning whose nidification nothing whatever is known.

To the author, this figure of 279, or approximately 12 per cent, may appear large: to us, and we venture to say to our readers, it is well nigh incredible that it should have been possible to record, with such accuracy, the nidification of nearly 75 per cent of the total within Indian limits.

In this connection, may we express the hope that Mr. Stuart Baker may find it possible, in contributions to this *Journal,* to indicate where and when to look for the nests of some, at least, of the unknown 279? To give an example, the nidification of the Masked Finfoot (*Heliopais personata*), recorded on pages 316 to 318 of the present volume, was discovered at the first attempt in 1920, when two keen field workers happened to be located in one of the breeding areas of this bird, but it is quite possible that it would have escaped them but for the hint obtained and recorded by Mr. Stuart Baker as far back as 1904.

The present volume commences with accounts of the breeding of the whole of the Birds of Prey, other than the Owls, which were included in Volume III, and continues with the Pigeons and Doves, Sandgrouse, Game Birds, Megapodes, Bustard Quails and Quails, Rails, Waders and Waterfowl, and as in the earlier volumes exactly follows the classification of the *Fauna*.

The author also continues his system of trivial nomenclature, which indicates, in the English name, the habitat, appearance, or some other distinguishing peculiarity of the bird, a system which, we learn, has been very greatly appreciated not only by the general public, who are apt to boggle at long Latin names, but also by the scientifically minded.

Throughout the book, Mr. Stuart Baker maintains the same high level which he has set himself in the previous volumes, and when he permits himself the luxury of an occasional page of descriptive writing, he gives us a vivid word picture of a Himalayan mountain side or a Burmese jungle which adds immensely to the charm and interest of the work.

As in the earlier volumes, the author has collated all the older material, and to this has added a very great deal that is new, the whole being presented in his inimitable and eminently readable style. We give it as our emphatic opinion that no field ornithologist can afford to be without this magnificent work, quite apart from its value as a contribution to Ornithological Science, and its appeal to all those interested in Indian bird life.

The book is illustrated by seven beautiful photographic plates, and the printing is once again all that can be desired, and very easy to read. We would also add a word of praise for the great care which has evidently been expended upon obtaining the correct spelling of the innumerable place names which occur throughout.

C. H.

OBITUARIES.

OSMOND CHARLES OLLENBACH.

Osmond Charles Ollenbach, formerly of the Survey of India, died at Mussoorie on the 6th July, 1935, aged 66 years.

Mr. Ollenbach was perhaps the doyen of Indian butterfly collectors, a fraternity which was in its hey-day in the more spacious times before the Great War. He himself used to comment on the decline of the hobby in India and attributed it partly to the lack of leisure and the more rigorous demands made upon people's time by the exigencies of life in the present day. Many enthusiasts had also left India on retirement and there were few to take their place.

Attracted to butterflies from childhood, Mr. Ollenbach took up the hobby of collecting as a boy in school, at Mussoorie. In those days the absence of works on the subject hampered serious study, but by the time he entered the Survey of India he found that opportunities for observing and collecting had so much improved that in 1900 he determined to start collecting seriously. In the next thirty years he captured and set about 17,000 specimens, comprising some 1,400 species, all of Indian Empire origin. To museums and learned societies in many lands he gave away 3,000 specimens and to other collectors over 5,000. The number now in the unique personal collection that he has left is roughly 9,000. They are most carefully preserved and scientifically classified in airtight cabinets, which Mr. Ollenbach loved to show to privileged visitors. Among those who saw his collection was Brigadier W. H. Evans—the noted authority on Indian Butterflies. In a letter to the Society, Brigadier Evans writes: 'I had corresponded with Ollenbach for many years but did not meet him until 1921, when our paths crossed in Burma. In 1922 I paid a visit to Dehra Dun and saw his collection not only of Butterflies but of insects of all Orders and I was very much impressed.'

Mr. Ollenbach's service years were spent in all parts of India, including Burma, the Andaman and Nicobar Islands, Kashmir, Hazara and the Himalayan region from east to west, and also Ceylon and Turkestan. In all these regions he had boundless opportunities of indulging in his hobby and more than once was helped by fellow-officers or friends who were keen naturalists.

Ollenbach was most generous in assisting other collectors and in presenting unique specimens to the Society's collections and to the South Kensington Museum. His knowledge of the habits of butterflies all over India and Burma were immense. Unfortunately he rarely wrote; but the Society has to thank him for several important notes and a comprehensive account of the Butterflies of Tavoy. Mr. Ollenbach also contributed articles and notes to Records of the Forest Department. Subsequent to his retirement he was employed as an Entomologist at the Forest Research Institute, Dehra Dun. After retirement he settled on his own estate at Dehra Dun and took a great deal of interest in his orchards. He leaves a widow and two sons.

WALTER ORMISTON.

Walter Ormiston was born in Hongkong where his father was the Manager of the Chartered Bank. He was educated at Rugby and after passing out as a Barrister at Lincoln's Inn, he practised at Hongkong. Finding the work uncongenial he gave up his profession and went to Ceylon where his family owned the Kalupahani Estate, at Keslande. He worked on the estate up to the year 1925, when he returned to Galle and made the Oriental Hotel his headquarters.

Ormiston was a born naturalist, his love of Nature and the out of doors, drew him away from the vocation for which he was trained. A keen fisherman—one of the most expert in Ceylon, he was the oldest member of the Nuwara Eliya Fishing Club. Animal and bird life attracted him. His observations were always wonderful; and as such he was a welcome and charming companion on shooting trips. He handled a rifle as cleverly as he handled a rod and was a keen member of the Ceylon Planters' Rifle Club. Stamp collecting was also one of his hobbies and as a collector he mastered the intricacies of his hobby and became an expert philantelist. But his chief claim to remembrance amongst naturalists will lie in his work on the Butterflies of Ceylon which he published in 1924. His experience as a collector and his close study equipped him for the task. He was in close correspondence with noted lepidopterists such as Brigadier Evans, Capt Riley and T. R. Bell. His work was based mainly on the collections which he made in Ceylon. They include long series of each species illustrating both dry and wet season forms and other variations. In writing his book he spent some time studying the collections at the British Museum. He gave the British Museum such Ceylon Butterflies as were unrepresented in their collection, besides many rare and abnormal forms. But the bulk of his collection of his Ceylon Butterflies he presented to the Bombay Natural History Society of which he was a member for twenty-five years. They are now preserved in separate cabinets as the 'Ormiston Collection'. His work as an entomologist will be remembered in the new species which have been named after him, this includes one species new to science named by Evans and Riley as *Amblypodia ormistoni,* two new races *Vacaduba herenice ormistoni* and *Terias andersoni ormistoni.* He died in the General Hospital at Colombo on July 12th, 1935, aged 71 years

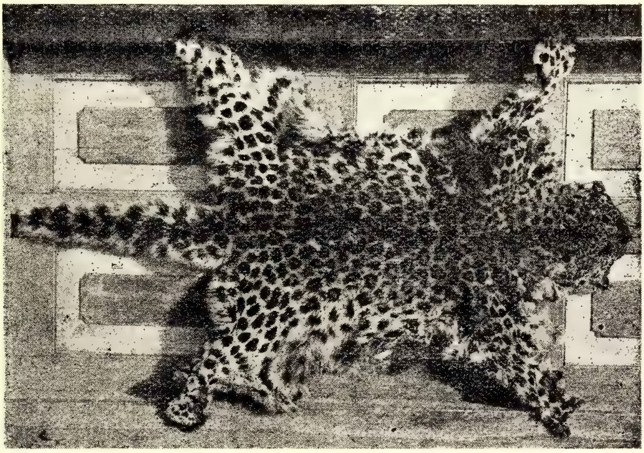
MISCELLANEOUS NOTES.

I.—TIGER VERSUS BISON.

With reference to a note in vol. xxxvii, No. 4 of 15th April 1935, anent a fight between a bull gaur and a tiger, Mr. W. S. Thom is mistaken in thinking that a tiger is no match for a full-grown bull bison. I have known at least six cases of solitary bulls having been killed by a tiger; about as many instances of unsuccessful attacks, including that of an old bull which had been severely mauled on its head, neck and shoulders and the near hind leg bitten through, the bone being completely severed. How this bull had managed to shake off the tiger after such a terrific mauling is difficult to imagine.

Honnametti Estate,
Attikan P.O., *via* Mysore, R. C. MORRIS.
S. India.
July 12, 1935.

II.—OCCURRENCE OF THE PANTHER (*PANTHERA PARDUS* LINN.) IN TIBET.



Skin of a panther shot at Thakpo, Tibet.

The accompanying photograph is of the skin of a panther said to have been killed in Thakpo which is in the Tsang Po valley, Tibet. The only difference I noticed between this one and the common Indian panther is that the colours are richer, the hair thicker and slightly longer and the tail broader but shorter. Unfortunately the skull was not brought in to me.

POLITICAL DEPARTMENT,
LHASA.
September 29, 1935.

R. K. M. BATTYE,
Captain.

III.—FURTHER RECORDS OF THE DISTRIBUTION OF THE CHEETAH (*ACINONYX JUBATUS* ERXL.) IN SOUTH INDIA.

With reference to my recent letter to you about the occurrence formely of the hunting cheetah (*Acinonyx jubatus*) in South India I see from the list of *Mammalia* taken from an article written in 1875 by the Rev. F. W. Jackson entitled the 'Mammals of the Coimbatore District, 1875', that the hunting cheetah was then sparsely distributed in parts of the Coimbatore District bordering the river Bhavani near Vellamundi and Kottamangalam. Five skins of *Felis jubata* examined in the Coimbatore Collector's Office in 1871 apparently came from the low hills about Kottamangalam (near Satyamangalam). The skins are described as having been 'in good order and undoubtedly those of *Felis jubata*'. The skin of a *Felis jubata* then in the possession of Mr. A. Wedderburn, Collector of Coimbatore, was obtained near Bolampatti, south of Coimbatore. I have already given instances of the hunting cheetah's former occurrence in the Mysore State, so you will realise that the distribution of the cheetah extended southwards well into the Coimbatore District, possibly further south than that.

Nicholson, in his *Manual of the Coimbatore District* (1887) records the Hunting Leopard as occurring in the Kollegal taluk at Bandhalli and in the Mysore State at Bandipur.

HONNAMETTI ESTATE,
ATTIKAN P.O., *via* MYSORE,
S. INDIA.
November 1, 1935.

R. C. MORRIS.

IV.—DESCRIPTION OF A BLUE BEAR (*URSUS ARCTOS PRUINOSUS* BLYTH) FROM TIBET.

A skin of a Blue Bear (*Ursus arctos pruinosus*) was sent to the Society in November 1935 by Captain R. K. M. Battye, who in forwarding the skin writes: 'The bear is said to have been killed near Hor in Eastern Tibet. I am told that the species lives only in the bare mountains where there is no jungle and where there is snow lying for 7 months in the year. Vernacular *Tre-Mo* or *Tom-Dre.*'

The skin is that of an immature animal, in general colouration it resembles the skin of an immature male from the Minshan Mountains, W. Kansu, presented to the British Museum by Capt. O. Fenwick Owen and described by Pocock (*J.B.N.H.S.*, vol. xxxv, p. 809).

Face, pale tawny, with a silvery sheen where the light catches the hairs. The basal portion of the hairs of the crown, cheek and forehead is dark brown, but this dark colouring is not seen unless the hairs are disarranged. A small patch of hair between the eyes brown; chin brown, ears dark ashy brown with an admixture of fulvous hairs. A distinctive collar of creamy hair interrupted in front of the shoulders where the dark basal part of the hair becomes more evident. The black of the shoulder mat is not very pronounced owing to the pale tipping of the hairs. This paling becomes more evident in the middle of the back, but is less pronounced on the loins flanks and rump where the pale tipping of the chair is less marked. Belly dark brown passing to yellowish brown on the breast. Limbs grizzled black. Claws pale, horn coloured. Fore claws 2½ inches, hind claws 1¼ inches. Hair on the shoulder mat 4-5 inches, on the back 3-4 inches.

BOMBAY NATURAL HISTORY SOCIETY, S. H. PRATER,
6, APOLLO STREET, BOMBAY. *Curator.*
February 12, 1936.

V.—RATELS AND CORPSES.

Mr. Clifford Hurst's letter in your issue dated December 1st 1935 brings the grave-digging habit of the Ratel out of the realms of 'Indian Superstition' to which Mr. Champion would relegate it.

A detailed enquiry amongst those whose business it is to deal with corpses, would further establish the Ratel's habits; and possibly more of your readers, whose business naturally does not lie in that direction, may nevertheless have come across isolated instances of grave-digging.

Mr. Champion has replied to my letter on the subject in a letter of his published on page 953 of your Volume xxxvii, No. 4.

A few comments on Mr. Champion's letter are called for, both personal and general.

In my letter to which Mr. Champion's purports to be a reply, I quote the case of Ratels habitually excavating in a grave yard and I gave a particular instance in which a Ratel (no other animal) had exhumed a corpse.

I expressly stated that this was only 'some' of the evidence at my disposal. Mr. Champion for his own convenience converts this to the 'only' evidence and finds it 'deplorable' that I should make statements on such flimsy foundations, The foundations are entirely of his creation for the special purpose of trying to meet an unanswerable case: moreover he entirely ignores the cemetery evidence: wisely.

Many people reading Mr. Champion's letter would conclude that he had hardly ever seen or encountered a Ratel, although his trip wires certainly have.

The letter contains no particle of evidence or observation whatsoever of any kind: much less in repudiation of the habit he denies. It goes further than that: it admits that he has never observed a grave yard: and definitely asserts that he does not intend to do so in future. One is thus left wondering how he proposes to support his contention: save by a process of transmigration. He certainly cannot observe corpses save where corpses are. It is time Mr. Champion told us when and where and under what circumstances, he has encountered Ratels, if at all, which give the lie to observed facts in regard to their habits: and in doing so he would gratify many, if he would tell us also of his personal experiences of the Ratel's courage, and which enabled him to confound his critics from a Bombay paper to which he refers.

Bishopmill, A. A. DUNBAR BRANDER,
Elgin, Scotland. I.F.S. (*Retd.*).
January 6, 1936.

VI.—RATELS AND CORPSES

With reference to the correspondence which has taken place in your *Journal* about Ratels and corpses, I should like to report the three following instances on which I saw Ratels at this work:

(1) In the Melghat Division in April 1926, I was sitting over a tiger kill two days old. In those days, one was allowed to sit up all night with an electric apparatus. I actually shot the tiger about 40 yards from the kill at 7-30 p.m. Being of the opinion that there was another one in the vicinity, I remained on in the tree. At some time between 11-30 and 12 midnight, I heard a noise which sounded like two animals fighting. It was a bright moonlight night and I saw movement near the carcass and watched these forms tearing and rummaging inside the carcass and fighting amongst themselves. I turned on my electric torch, as I was unable to make out what they were and discovered them to be a pair of Ratels. One looked up into the light and moved away about 20 yards, the other did not take the slightest notice. I picked up my shot gun which was loaded with lethal and tried to change over to shot, but the noise drove the animals away. They did not reappear.

(2) In the Chakata Block of the Haldwani Division in December 1928, I was 'ghooming' in the early morning in the hope of finding a tiger or a panther on one of the tie-ups, or meandering about the road. I moved into a dry river bed (Nala) and about 200 yards off the forest track I got an odour of a carcass. In moving forward round the bend of the Nala which was all sand, I noticed a lot of tiger pug marks and saw about 60 yards away two Ratels scratching and scraping at something in the bed of the nala. I watched them for quite a long time. The earth flew and they seemed to be feeding on something dead, as the odour was pretty strong even where I was. After about 10 minutes, I shot one of these animals and on going up to see what it was, discovered it to be a human corpse which had been covered over with about 6 inches of sand. The part about the neck and the left shoulder had been torn and eaten by these Ratels. The remainder of the corpse was a good deal decomposed, and there was no doubt about it, that these Ratels had exhumed this body and were feeding on it.

(3) My third instance took place in the Jaulasal Block in the Haldwani Division in April 1933. I was wandering about on an elephant at dawn, and was shown by the mahout a Ratel moving across an open patch between two bits of forest. I watched the beast very carefully and suddenly I heard a noise as if there were more Ratels quite near. I told the mahout to make the elephant advance very slowly and quietly. After having gone about 20 yards I saw four Ratels on an old carcass of a cheetal doe. One was actually inside the carcass which was, I should say, three to four days old. Suddenly one of them saw the elephant and gave a queer little yelp and they all ran away. I did not move from the spot for about 10 minutes in order to see if they came back. The time must have been somewhere between 6-30 and a quarter to seven. To my amazement, two of the four returned and advanced slowly towards the carcass. They never reached it again, because I think they must have caught sight of the flap of the elephant's ears, as they disappeared very suddenly.

GOVERNMENT HOUSE,
BOMBAY.
January 25, 1936.

C. G. TOOGOOD,
Lt.-Col., D.S.O.

VII.—THE BIRTH OF AN ELEPHANT CALF.

With reference to Mr. Tutein Nolthenius's note under the heading of 'The Birth of an Elephant Calf' in the *Journal* of August 15th, in vol. xxxvii, No. 3, I referred to the death of a wild elephant while calving. This elephant was found dead lying on its left side with the hind quarters of the calf only exposed.

On another occasion I happened on a spot where a cow elephant had calved on a sandy path in open scrub jungle; there was no sign of the placenta.

HONNAMETTI ESTATE,
ATTIKAN P.O., *via* MYSORE,
S. INDIA.
September 3, 1935.

R. C. MORRIS.

VIII.—WHY ELEPHANTS TURN 'ROGUES'.

I wonder if any of your members has any information as to the real reason for elephants turning 'rogue'. The usual theory is that some old and cantankerous elephant is turned out of the herd, specially during the 'musth' or rutting period, by a more powerful male, and this old and ill-tempered fellow gradually becomes a confirmed 'solitary', and in time becomes dangerous to human life and property. My experience in the Chittagong Hill Tracts (on the borders of Bengal, Bihar and Assam) leads me to question this, for on at least three occasions, I was attacked by well-known 'rogues' which after being shot turned out, in spite of their commanding size, to be quite young fellows, with no signs of wounds or injuries likely to cause them pain or discomfort, which might turn them soured in temper. One fellow who very nearly got me, was quite small, standing barely seven feet at the shoulder, and must have been only a young lad, yet he had been by himself for months, in the plains during the rains, when all herds were away among the higher ranges. Every rogue I shot myself, and every other which was shot by others, and which I had the chance to examine, had undoubted need for a dentist for at the root of the tusks of each one of these animals, I found pounds and pounds of live maggots, which must have caused them excruciating agony. I am inclined to think that it is this tusk-disease, which makes them, young and old, so bad-tempered, and forces the others to kick them out of the herd. Whenever tracking a 'rogue' or 'solitary' (undeclared rogue), I have noticed that the animal frequently thrusts his tusks through ant-hills, or soft saplings, and as I have never seen the marks of tusks thrust through in this manner when a herd has passed, nor have I seen our tame elephants doing this, I feel that I am not far wrong in holding that they do this in order to relieve the agony caused by the maggots far inside their jaws. During my stay in that area, I tracked and followed up herds and solitaries—literally by the hundred, so my observations were not quite casual, and were spread over a period of nearly four years. I hope this may bring some light on the matter.

RANGPORE,
E.B.R.
August 2, 1935.

S. K. GHOSH, I.C.S.,
District Magistrate.

[Mr. R. C. Morris comments on Mr. Ghosh's letter as follows:—

'While agreeing with Mr. Ghosh that in many cases tusk disease is the cause of many elephants turning into rogues, this is by no means the cause in all cases, in fact most of the elephants I have shot or helped to shoot had no apparent disease in the tusks. Marginal *gum* disease of elephants is very common, occurring in the case of both wild and tame elephants, probably due to food packing under the gum, but this would not account for elephants turning into rogues. Frequently inflammation from old and fly-blown wounds may be the cause (the last rogue I shot had had its tail bitten off and the stump was diseased). Again in some cases there is no apparent reason for the elephant having become a rogue. In two cases this was undoubtedly due to the elephants' tusks being crossed, resulting in difficulty in feeding. Only in two cases was I sure the elephants' ill-temper was due to tusk disease. That elephants with tusk disease do thrust the diseased tusk into ant-hills and young trees is correct. A broken end of a tusk, about a foot long, was brought to me some years ago, the Sholaga had found it wedged firmly into a tree, and Sir Frank Colyer, to whom I sent the tusk, expressed the opinion that the elephant had been suffering from tooth-ache.

Seven or eight rogue elephants have been shot in the Madeswaranmalai Reserve in this district in the past ten years, one of these was definitely handicapped having tusks crossed so close to its jaw that the elephant must have experienced considerable difficulty in feeding itself, but the others were healthy animals, and I put their ill-temper down to the fact that their favourite grazing grounds bordered a much-frequented pilgrim patch up to the famous Madeswaranmalai temple. Nearly every day, devotees journeying up and down this path create a good deal of noise, especially once a week, and I think that this continual row used to irritate solitary elephants frequenting the bamboo jungle there. In every case the elephant was proscribed owing to its adopting an aggressive attitude towards pilgrims on this path.

I am convinced that one of the chief causes of elephants turning into rogues now-a-days is due to ryots firing at elephants raiding their fields. The herds are nearly always led by a bull. The ryots, who now nearly all have guns, cannot be blamed for their action in this respect, and it is up to Government to create a Game Department, which will take measures to prevent the continuous raids on fields that are now carried on during the harvest time by the increasing number of elephants.'—Eds.].

IX.—THE FORMATION AND ABSENCE OF TUSKS IN ELEPHANTS.

With reference to Sir Frank Colyer's article in the Society's *Journal* of 15th November 1930, and my comments on the same which appeared under 'Unerupted tusks of Elephants' in *Journal* 4, vol. xxxv, I enclose extracts of further correspondence on the subject between Sir Frank Colyer and myself which may be of interest.

Extract from a letter dated 11*th November* 1934 *from Sir Frank Colyer.*

'It is a most unusual condition for an animal to have one tooth absent and the other well developed. It does occur in the Narwhal but in that animal it is the normal. The tusk in many Indian elephants seems to be a degenerate organ. Is that not the case? That is, do not a good number of elephants fail to develop tusks? Is it only the females? Have the calves which have shed a tusk been followed up to see if the tusk which develops on the other side is a well-formed and grown tooth? It is most important to settle this question. I take it that in your view many elephants which have only one developed tusk have at some time possessed another small tusk which was shed in early years. Further you think that masses such as you sent me may really be formed from a tooth germ which has failed to produce a tusk in the proper way but has formed a shapeless mass which is retained in the bone. It may be so but, judging from similar conditions which I have seen in other animals, and they are very rare, the mass of hard tissue formed is not tissue which approaches to the structure of the normal tooth.

I have had another good look at the specimen you sent to the Museum and have discussed the tooth with some of my friends and we still think that it is not an aborted tooth but is the remnants of the formative parts of a tusk which was once in position. If you can prove that elephants which shed one tusk as calves develop really well-developed tusks then you have something to support your contention. I had a long talk to Major Powell-Cotton, a Big Game hunter and collector, and who has seen plenty of elephant life in Africa. I put the question of the frequency of tusks with severe fractures in a longitudinal direction and he remarked that such conditions were to be expected when one realised the way in which the African elephant used the tusks for breaking trunks of trees etc.

I see that the "erosion" of the female tusk does occur in the animal from the wild state. The case described by Sclater in 1871 was from a wild animal. If you do obtain another mass from a single tusker and will send it to me I will have it cut in two, examined and returned to you.'

Extract of my reply dated 29*th October* 1935.

'In your letter you put forward two or three queries, and you expressed the opinion that the tusk in many Indian elephants seems to be a degenerate organ, which would certainly seem to be the case as quite a number of male elephants fail to develop tusks and in Ceylon of course tuskers are uncommon. It is my view that many elephants which have only one developed tusk were possibly born with only one tusk, or when their "milk tushes", as it were, were shed they were replaced by only one instead of a pair of tusks. I had some correspondence on the matter with Mr. Gordon Hundley of Steel Brothers & Co., and one of the Bombay Burma Trading Corporation men. Both these Companies maintain, as you no doubt know, a large number of elephants, several thousand in fact. Gordon Hundley informed me that calves have been known which developed into single tuskers and referred me to Evans's work on *Elephants and their Diseases.* He also told me an interesting thing; that ivory thieves used to steal whole tusks from a living tusker by repeated blows on the point; after a certain period the tusk so maltreated can be removed or is shed. Also that one type of tusker will "cut through" a large tusk in a comparatively short time by continually "knocking" a trunkful of grass against one of his tusks.

Evans in his *Elephants and their Diseases* records a case where an elephant dropped a male calf which grew up with only one tusk. He also states that Selous recorded it as far from uncommon to meet with one-tusked animals among elephant cows in South Africa, though rarer among the bulls; and when an elephant has only one tusk the bone on the other side is quite solid and shows no sign of a hollow where the hollow ought to be. This has exactly been my experience, and you will recollect my informing you of this myself in regard to Indian single tuskers. Evans goes on to say that "Males occasionally lose a tusk when fighting or through other injury but some are born with a single tusk". Evans disagrees with Sanderson in the latter's statement that the first tushes of a bull elephant are never shed and says that on the contrary the milk tusks are shed between one and two years of age and replaced by the permanent ones.

If I do obtain another mass from a single tusker I will certainly send it to you.

Evans in his classical work on elephants mentions instances of mucknas (tuskless males) being feared even by powerful tuskers. This of course is well known among the jungle tribes both in India and Burma; mucknas seem to make up in size of body and trunk for the lack of tusks and are generally enormously powerful elephants. In fights between mucknas and even large tuskers as often as not the tusker will be defeated. Evans quotes a case of a fight between a good-sized tusker and a large muckna which was well known in the Shweli forests of Burma. During the course of the battle the muckna snapped off one of the tusks of its opponent with its trunk. A somewhat similar instance is recorded of a fight between a muckna and a tusker in which the former was seen to seize and break off one of the tusks of its antagonist.

HONNAMETTI ESTATE,
ATTIKAN P.O., *via* MYSORE, R. C. MORRIS.
S. INDIA.
October 29, 1935.

X.—HORN GROWTH AS OBSERVED IN BLACK-BUCK AND NILGAI.

I have always been under the impression that horns, by which is meant the outer horny covering of hollow-horned animals, grew without any break from early age to death in all species of *Bovidae*, e.g. Bison, Buffalo, Black-buck, Chinkara, Nilgai, Four-Horned Antelope etc. This at least is what I have read in most books dealing with Natural History, the solitary exception to the rule being the Prong-horn Buck of America; which annually sheds its outer horny covering of the bony core. Within the last two years however, four cases have come under my direct observation of partial shedding of outer horns, one case of Black-buck and three of Nilgai.

In the case of the Black-buck this is a perfect example of new growth of horns displacing the older horn from underneath and growing in the usual way. The buck when shot was noted as being immature, but carrying an exceptional head for his size. On examination this was found to be due to the lower and inner pair of horns having forced out an older and outer pair, which however had not been shed, but were still joined to the new pair. The joint is quite firm, the older pair of horns are splintered slightly at their junction through the forcing action of the new horn growth, thereby showing how the annular ridges of the lower horn fit perfectly with those of the outer horn. No doubt in the course of time by fighting, or otherwise, the older horns would have dropped off. This buck was shot in the Philibit District. The length of horns by straight measurement are right 21 in., left 21 in.; rather exceptional for the district where the average is 17-19 in. The outer horn-covering measures 16½ in. right and 15¾ in. left. Both horns are in my possession, though unfortunately the skull was cut down to form a small frontlet; my not being a very keen or expert field observer in those days. I kept the head out of curiosity and as something out of the usual.

In the case of Nilgai (Blue-Bull) which are fairly common in these parts (Behar), on two occasions I have noticed horns of old bulls covered with a sleeve of horny substance, evidently part of an outer horn casing in the process of shedding, such shedding taking place gradually by wear and not by the dropping of the entire outer casing. In my latest case however, I noted the horns of an old bull much splintered along their length, with indications that there were perfectly formed horns beneath the damaged covering. I took some pains about cleaning this head and now have a horn (right) showing very clearly how the outer covering is separated and shed from the newer growth; such shedding taking place along the entire length, and most probably assisted by the animal rubbing his horns against trees, bushes, etc. Length of right horn 8½ in. The left horn was unfortunately freed of the old covering by my servant, who misunderstood my instructions.

In view of the above-noted observations of mine I would be glad to know if any other sportsmen or naturalists have recorded similar cases.

Burma-Shell Co., Ltd.,
Muzufferpore, Bengal. J. E. HALL.
October 1935.

XI.—EARLY DEVELOPMENT OF ANTLERS BY SAMBHUR IN THE BILLIGIRIRANGAN HILLS, SOUTH INDIA.

There is an astounding number of sambhur on the Billigirirangan Hills, Kollegal and North Coimbatore Divisions, this year including many fine stags.

There are two interesting features in connection with the present increase in the number of sambhur, and here I may say that chital and bison have also appeared to have increased correspondingly. Many of the sambhur stags were in hard horn this year in August, which to my knowledge has not happened before within the past twenty years. By the end of the current month the remainder should be out of velvet. Further the sambhur seem to be unusually fearless this year. Time and again a group will trot off quietly on being approached and will then recommence grazing about 300 yards away. It is to be hoped that this is one of the first fruits of stricter game preservation, but I can hardly think this can be the case as yet. It would be extremely interesting to learn what actually governs the early or late shedding of antlers and growth into hard horn again, and what has caused stags to be in hard horn two months early this year. The increase in the number of large heads is remarkable.

Honnametti Estate,
Attikan P.O., *via* Mysore, R. C. MORRIS.
S. India.
September 6, 1935.

XII.—WHITE BISON.

Mr. Morris asks where White Bison are to be found in the Central Provinces. The answer is the Mandla-Balaghat jungles and their associates and the Chanda District. This list is not prescriptive, it is only what I know of.

As Mr. Morris does not agree with me in thinking that 'dormouse colour' and 'sandy or light fawn' are interchangeable colours, I would be grateful to know in what terms he would describe 'dormouse colour'.

I take exception to Mr. Morris's remark that I admit in *Wild Animals in Central India* to not having much experience of Bison. Disparagement is generally evidence of a poor case. Such an admission on my part is a sheer impossibility, as I have lived amongst Bison throughout most of my service. As you, Mr. Editor, have given publicity to Mr. Morris's remarks, I would request an equal publicity to any quotation he can make, from anything ever written by me, which supports his statement, or as an alternative a complete and adequate withdrawal by him.

BISHOPMILL,
ELGIN, SCOTLAND.
January 6, 1936.

A. A. DUNBAR BRANDER,
I.F.S. (*Retd.*).

XIII.—MATING HABITS OF CROWS

With reference to the Miscellaneous Note xii (Mating Habits of Mynas and Crows), p. 186 of vol. xxxviii, No. 1, I may say that I have seen crows coupling twice in the normal manner of birds, in the afternoon at quiet spots where the pairs were by themselves on both occasions. I remember the incident because because one sees it so very rarely and because of a belief amongst the people of this part of the country, that such a sight foretells one's death within the next six months and, though one has no faith in such beliefs, it made me remember the incidents.

There is also a belief that crows hold a sort of council of their community—a lot of them are seen gathered together in a partial circle with one crow in the middle who is being chastised by two or three crows. The one so pecked at, receives his punishment meekly without any retaliation. The supposition is that the crow has committed some offence against the Crow-community and is so receiving his punishment quietly. I have seen such gatherings also. The Mynahs also have such small gatherings to witness the duels which occur then.

ICHALKARANJI.
September 5, 1935.

NARAYAN RAO BABASAHEB,
Chief of Ichalkaranji.

XIV.—EXTENSION OF THE RANGE OF THE WHITE-BROWED BULBUL (*PYCNONOTUS LUTEOLUS* LESS.).

The limit of distribution in the extreme east or rather north-east, of *Pycnonotus luteolus* Less. is given as Midnapur in the *Fauna* volumes. Mention of this is also made in Mr. Stuart Baker's *Nidification*, i, 398. Evidently this description is based on Tickell's original record (*J.A.S.B.*, ii, 573) from a 'woody and barren country at Bamireah, near Mednapur'. Blyth noted three specimens procured in 1847 in Midnapur jungles (*Cat. B. Mus. A.S.B.*, 210). So far as Western Bengal is concerned these appear to be the only records available. Mr. Whistler, though he writes of this bird (*Handbook of Indian Birds*, 1935, 65) as common in Western Bengal, is silent as to whether it is found anywhere else than Midnapur. It is of interest to note that in my excursion to Satgachia (20 miles east of Burdwan town), district Burdwan on June 23, 1935, I came across this species affecting the scrub-jungles on and near the bank of the river Banka. I collected one specimen alive with the aid of a bird-catcher. I also found it rather common and fairly numerous in the neighbouring thickets and unfrequented orchards on the Kalna Road, where I collected a second specimen.

Measurements:

No. 1. Apparently ♀ adult. Iris reddish brown. Bill somewhat slender. Wing 89 mm., tail about 88 mm., tarsus 23 mm., culmen 16 mm.

No. 2. Juvenile in moult. Iris brown. Bill stout. Wing 86 mm., tail 87 mm., tarsus 23 mm., culmen 16 mm.

By nature these birds do not appear to be as bold as their congeners, *Molpastes h. bengalensis* Blyth. and *Otocompsa e. emeria* (Linn.), with which they were sometimes observed to consort together. Skulking and evasive, they try to avoid detection as much as possible and, only when uttering their lusty warbles, serve to reveal their identity either in high tree-tops or low bushes. It is possible to spot them by their call, but it is difficult to get a good view of them.

There is no doubt the species is distributed beyond its recorded limit, still further north-east. The locality where the first specimen was secured is obviously typical of its haunt in a scrub and bush country. Hedges and thickets stretch along to some distance but are not very dense. The neighbourhood where the second specimen was collected harbours numerous orchards and garden-lands (Burdwan Raj's Staging Bungalow is among them) mostly in disuse, with an array of prickly undergrowth and secondary jungle. Here towards evening I saw quite a number of these birds, often going about in pairs. On my approach they would slip out of view and seek cover in lofty trees, wherefrom they would pour forth their voluble notes.

Ecologically the whole of this locality has no doubt much in common with the deltaic alluvium of Central Bengal, nevertheless its proximity to the more open, undulating and arid zone characterising a large section of the district does not altogether leave it impervious to its influences. Inasmuch as it is traversed by the Banka, originally a spill channel of the Damodar, which brings down vast quantities of silt from the Chota-Nagpur plateau, the action of this river has apparently not been inconsiderable in bringing about a gradual transfusion of the soil peculiarly favourable to the growth of scrub and bush jungle.

50, KAILAS BOSE STREET,
CALCUTTA.
October 22, 1935.

S. C. LAW, M.A., Ph.D.,
F.Z.S., M.B.O.U.

XV.—FURTHER REPORT ON THE NESTING OF *GEOCICHLA C. CITRINA* LATH. IN 24-PARGANAS (BENGAL).

I had on two previous occasions (*J.B.N.H.S.*, xxxvi, 501-2; *Ibis*, twelfth series, i, 778) recorded my observations on the nesting of *Geocichla c. citrina* Lath. in the district of 24-Parganas. I have now to report further instances which came to my notice:

July 2, 1935. Two young secured near Dum Dum from a nest in a mango tree.

July 10, 1935. A clutch of four fledgelings, also another clutch of two young: locally procured by a bird-catcher and brought for sale to the bird fair on the occasion of the Car Festival.

July 14, 1935. Nest with two young found in a bamboo clump in a place called Kerati near Dum Dum Aerodrome. One young ♀ still thriving in my aviary.

August 28, 1935. A nest found near Dum Dum Aerodrome with two young just hatched out.

It appears that protracted drought and exceptional weather conditions due to belated monsoon prolonged the period of nesting.

50, Kailas Bose Street,
Calcutta.
October 22, 1935.

S. C. LAW, M.A., Ph.D.,
F.Z.S., M.B.O.U.

XVI.—THE DISTRIBUTION OF THE KASHMIR ROLLER (*CORACIAS GARRULA SEMENOWI* LOUDON & TSCHUSI).

In October 1935, Br. A. Navarro, S.J., of the St. Xavier's College Museum, obtained two specimens of the Kashmir Roller (*Coracias garrula semenowi*) at Khandalla. As the *New Fauna* limits this bird to an area in North and North-Western India, the following records of its occurrence in Peninsular India may be of interest.

Davidson (*J.B.N.H.S.*, xii, 43) records a single specimen from Majoli, 5 miles north of Karwar, in November 1893. In the Bombay Natural History Society collection there are two skins obtained by T. R. Bell at Karwar in October 1898.

At a meeting of the Society held on 24th April 1900, E. H. Aitken mentioned the *European Roller* as one of the birds 'not usually found in or near Bombay, which had appeared that year, owing no doubt to the want of water and food in Guzerat and the Deccan' (*J.B.N.H.S.*, xiii, 398).

These records seem to show that the Kashmir Roller is a more or less regular visitor to the south along the line of the Western Ghats. In the field this bird may be distinguished from the Indian Roller or Blue-jay (*C. benghalensis*) by the absence of the large brown patch on the upper breast.

Godrej House,
Andheri.
November 29, 1935.

H. ABDUL ALI.

XVII.—HABITS OF THE PLAINTIVE CUCKOO (*CACOMANTIS MERULINUS* SCOP.).

I have recently had the opportunity of observing the bird described by Jerdon as the Indian Plaintive Cuckoo, at a place just below Kasauli, height about 5,000 ft. above sea-level. I saw a single bird several times, with the usual grey plumage. It was not at all shy, and I was able to see it at close quarters with field-glasses and to hear the typical call.

Yesterday evening I saw the bird with what I took to be its mate. This was bright rufous, with the abdomen barred, exactly as described by Jerdon as the adult in rufous plumage. What interested me was the fact that for the most part the rufous bird remained perched on the branch of a tree, whilst the grey one foraged for caterpillars, which it then brought and presented to the other, which ate them with relish.

Can you tell me whether it is a common event for a bird to feed its mate in this way? The rufous bird can scarcely have been one of the progeny of the gray one, for surely a cuckoo does not feed its own young.

Since writing the above I have come across an article by E. C. Stuart Baker in your *Journal*, vol. xvii, p. 83, in which he quotes Capt. Hutton's remarks regarding the Himalayan Cuckoo, *C. optatus* (Oates' *Nests and Eggs*, ii, p. 381):—'I have seen the young cuckoo sitting for hours together on a branch waiting for the return of the adult which continued every now and then to bring supplies of caterpillars wherewith to satisfy the apparently insatiable appetite of the nestling until at last both would fly off to another spot.' This exactly describes what I saw, but I think there is no doubt that the bird I saw was the Indian Plaintive Cuckoo.

PASTEUR INSTITUTE OF INDIA,
KASAULI, PUNJAB.
July 11, 1935.

G. COVELL,
Lt.-Col., I.M.S.

XVIII.—THE SHORT-EARED OWL [*ASIO FLAMMEUS* (PONTOPP.)] OUT AT SEA.

On the 19th October this year while on board the s.s. *Vita*, on my return journey from Cutch I noticed a bird, soon followed by two others, approaching the ship from the west. The ship was then about four hours' journey from Bombay Harbour. The flight of the birds was owl-like; but it was not until they came near that I was able to be sure. Finally one of them settled on the rigging quite close to me and it proved to be the Short-eared Owl (*A. flammeus*). The birds followed the ship for about an hour, at times flying high above the ship, at others just skimming the water's surface, in the same manner as do gulls. After this they went east towards the land which was just visible.

These birds were evidently on migration, as it is well known that the Short-eared Owl visits India during the winter months.

Bombay Natural History Society,
Bombay.
October 23, 1935.

C. McCANN.

XIX.—VULTURES FEEDING AT NIGHT.

I noticed on p. 190 of vol. xxxviii of the *Journal* a note by Mr. R. C. Morris on vultures feeding at night.

In case it is of any interest, I had an identical experience in 1921 when sitting up over a kill for a tiger near Neemuch. In my case, however, the vultures were disturbed before they could entirely demolish the kill.

Machine Gun School,
Ahmednagar.
September 18, 1935.

W. GOUGH.

XX.—PROBABLE BREEDING OF THE BLACK-WINGED STILT (*HIMANTOPUS H. HIMANTOPUS* LINN.) IN THE SHWEBO DISTRICT, UPPER BURMA.

In vol. xxxv, No. 1, of the *Journal* (June 15, 1931), I mentioned having found a small colony of Stilts obviously breeding two miles east of Kinu in the Shwebo district in July 1931 on a bog of volcanic origin, which is locally called a 'soap-bog'.

I had no opportunity to revisit this place until August 4th, 1935, when I flushed a single bird out of the rushy grass on the edge of the bog which was very loath to leave the place and almost certainly had young ones in the grass. The main part of this bog, about ten acres, is quite impassable, and the only other birds frequenting it were *Charadrius dubius jerdoni* and some Temminck's Stints.

The only other breeding records of this bird from Burma are from Myingyan in June and July 1900-1901 (*J.B.N.H.S.*, xvii, p. 499).

Myitkyina,
Upper Burma.
August 6, 1935.

J. K. STANFORD,
Indian Civil Service.

XXI.—THE JACK SNIPE AND THE WHITE-EYED POCHARD IN HYDERABAD.

The Hyderabad State Ornithological Survey did not come across the Jack Snipe (*Lymnocryptes minima*) and the White-eyed Pochard (*Nyroca rufa*). Major R. H. Stable, 3/6th Rajputana Rifles, whose game register for the seasons 1928-1930 is filed at the Society's office, shot jack snipe at Secunderabad as follows:

Season 1928-1929. 7 jack between 16th October and 22nd February, out of a total of 181 snipe.

Season 1929-1930. 33 jack between 9th October and 15th February, out of a total of 408 snipe.

In Stuart Baker's *Ducks*, Mr. P. M. Allen is recorded to have shot a pair of White-eyes in the Nizam's territory at Nalgonda, latitude 17°22′.

Godrej House,
Andheri.
November 29, 1935.

H. ABDUL ALI.

XXII.—SOME RARE BIRDS IN NORTHERN BURMA.

The records which follow are from the Myitkyina district. These skins have been sent to Dr. C. B. Ticehurst, whose notes are in square brackets.

Suthora unicolor. Brown Suthora.

There do not appear to be any Indian records of this Crow-Tit since the first edition of the *Fauna* was published. There are certainly none from Burma.

Mr. W. Stubbs shot a female on December 29th, 1934, on the Pajao-Nahpaw road, which winds round the western edge of Lungrebum (8,528 ft., Sheet 92, Survey of India). Lungrebum is at the extreme east-south-eastern corner of the Myitkyina district, and forms here the Myitkyina-Yunnan border. A few miles to the south-west, the Myitkyina and Bhamo districts meet at Nabang. I examined this bird a few minutes after it was shot and it was apparently with a flock of seven or eight others feeding in stunted cane jungle (which is a feature of this area), on a treeless hillside at about 7,000 ft. It had a most distinct white ring round the eye, a character not noted in the *Fauna*, and I recorded the soft parts at the time as: *iris* pale yellowish white, *bill* pale horny yellow, *legs* and *claws* plumbeous-green. I shot specimens of *Pseudominia castaneiceps* and *Fulvetta manipurensis* in this locality, on the same day but had no other opportunity to visit these hills.

[This specimen, as might be expected, belongs to the Yunnan-Szechuan form *canaster* described from Washan, Szechuan, by Thayer and Bangs and of which *saturatior* of Rothschild from the Shweli-Salween Divide is said to be a synonym. Mr. Stanford's bird matches Yunnan examples in the British Museum. *Suthora unicolor canaster* is a new form to the avifauna of British India.]

Pomatorhinus ferruginosus. Coral-billed Scimitar Babbler.

The *Fauna* (Edition II) does not record any race of this Babbler as occurring between the Chin Hills and Yamethin, in Central Burma. In December 1933, I had a close view of a Scimitar Babbler with a vermilion or coral-red beak and a white supercilium at about 3,000 ft. in bamboo jungle near Sumprabum. In May 1934 Mr. W. Stubbs obtained a female at Kambaiti on the Yunnan border (7,000 ft.). In December 1934 I saw two or three, and shot a male on the Sadon-Sima frontier road at between 5,000 ft. and 7,000 ft. These were all with flocks of *Actinodura egertoni* in bamboo and tree jungle and, unlike the latter, were extremely shy, giving only momentary glimpses of themselves and uttering a repeated 'churring' note. When seen, the supercilium and bill were most distinctive characters in the field.

[This Scimitar Babbler belonged to no known form of *ferruginosus* and therefore I described it as new under the name *Pomatorhinus ferruginosus stanfordi* (Bull. B.O.C., lv, p. 178, June 1935).

At the same time I feel doubtful if *P. f. mariae* from the Karen Hills is different to *P. f. albigularis* from North Tenasserim but only fresh material from these two localities can decide the question.]

MYITKYINA.
June 1935.

J. K. STANFORD,
Indian Civil Service.

XXIII.—NOTES ON ELWES' HORNED PHEASANT (*CROSSOPTILON HARMANI* ELWES).

Location.—Near Nyengo, Tibet, about half way up the Gokar La Pass. Altitude 14,000 ft. Latitude 29°25′N. Longitude 91°33′E. Date 21st August 1935.

Type of country.—Steep-sided mountain, thickly covered with several types of dense prickly bushes, stunted silver birch trees, herbs and grass from which large rocks protruded in abundance. Country very difficult to move over.

Habits noticed.—A covey of 7 adult and young birds was first seen sitting on a rock. They were conspicuous by their red legs and feet. When this covey was flushed a number of other Crossoptilon started 'clucking' and showed this particular part of the mountain side to be swarming with them. It was not difficult to approach them to within 40 yards. When flushed they flew down hill. Amongst those seen were a number of young birds somewhat resembling black partridge both in colour and size.

The adults appear to have two distinct cries—one a 'Cluck' of alarm with a rather metallic resonance, and the other a communication call resembling the 'come-back' of the domestic guinea fowl. The young birds' call is a kind of shrill whistling cry very similar to that of the Marmot.

POLITICAL DEPARTMENT,
LHASA.
September 12, 1935.

R. K. M. BATTYE,
Captain.

XXIV.—MIGRATION OF WILDFOWL.

(*Continued from volume* xxxvii, *page* 738).

Since the publication of the last recoveries of ringed birds, the following recoveries have been reported to us:—

Place of Ringing	No.	Date	Species	Ringed by	Date of recovery	Locality	Remarks.
Indore State.	720	12- 2-29	Coot (*Fulica atra*)	Conservator of Forests, Indore	March 1929	Near Station Veliko-Alexeevskaya, Trans-Siberian Railway, Province Tashkent.	
Kashgar, Chinese Turkestan.	2973	27- 1-29	Mallard (*Anas platyrhyncha*)	Capt. G. Sherriff	1-5-35	Village Lukovka, Pankrushicha, Region Kamensky, W. Siberia.	
Khadi Lake, Sujawal Taluka, Karachi Dist.	3953	18- 1-30	Pochard (*Nyroca rufa* 2)	Meher Aly Shah	April 1233	Village Solo-Tumba Kazak, Autonomous Republic 44° 34′ N., 66° 7′ E.	
Manchar Lake, ca. 26 °N × 68E. Shewan Taluka, Sind.	1271	21- 3-30	Shoveller (*Spatulaclypeata*)	K. G. Advani	25-5-30	Bolshië Tochty, Barabinsk Dist., Siberia.	
Purnia Tank, Dhar State.	82	14- 2-29	Common Teal (*Nettion creca* juv.)	Ahmed Nur	31-3-35	Village Novo Pokrovskoe, region Kantovski, 14 km. off the town of Frunse (formerly Peshpek) about 42° 26′ N., 74° 15′ E.	
Jhajja, Bahawalpur State. ca. 29 °N. × 72E.	2128	11-12-28	Dun Bird (*Nyroca ferina*) ♂	G. Atkinson	15-5-30	Bolshië, Tochty, Dist., Barabinsk, Siberia.	

Since the commencement of the Society's Bird Banding Scheme approximately 4,000 rings have been issued to members and others interested in the migration of wildfowl. So far 26 birds have been recovered of which 13 were recovered in India either in the same year as they were ringed or on return from their breeding rounds. The remaining 13 were reported to have been captured or shot outside Indian limits, chiefly in Siberia.

Owing to the absence of properly organised Bird Banding Stations in India the ringing of wildfowl has been confined to ducks in places where they are regularly snared or shot.

BOMBAY NATURAL HISTORY SOCIETY,
BOMBAY. EDITORS.
January 1936.

XXV.—DO BIRDS EMPLOY ANTS TO RID THEMSELVES OF ECTOPARASITES?

In the course of our collaboration in the account of the birds of Bombay and Salsette (to be published in this *Journal*) my cousin Humayun Abdulali recently sent me the following note on Jerdon's Chloropsis [*Chloropsis jerdoni* (Blyth)].

'On 8 September 1934 I observed a pair catch and eat Red Ants (*Oecophylla smaragdina*) on a mango branch. The ants were captured in the beak and then quickly but deliberately rubbed into the tail feathers before being swallowed. Every ant captured was scrupulously treated in this peculiar fashion.'

He speculates that the ant is crushed and the sac-like abdomen bursts in the process discharging formic acid 'which may be absorbed by the fluffy tail-coverts' (?)

As far as I am aware, a similar observation has not been made in India before and Abdulali deserves credit for *recording* what most people would have considered far too trivial or 'original' to bother about. The instance only shows—if an example were needed—how much there is still to be learnt by an unprejudiced study of the *live* bird.

Referring to literature, it is interesting to find that the same question as heads this note was put forward by Dr. E. Stresemann in the *Ornithologische Monatsberichte* for July-August 1935 (p. 114). He pointed out that the expected discussion had not been produced by the publication of H. Heine's note in *Orn. Monatsb.* in 1929 (p. 188) under the title 'Crows use Ants to get rid of Ectoparasites', but that he had now, for the first time, found quite similar observations recorded in the recent book by A. H. Chisholm, *Bird Wonders of Australia* (Sydney, 1935), pp. 153-5.

In the note referred to, Heine had observed some Hooded Crows (*Corvus cornix*) deliberately seeking an ant-hill of *Formica rufa* and squirting or allowing themselves to be squirted with formic acid in order, the author presumed, to rid themselves of ectoparasites. Mr. Chisholm in his book, describes European Starlings (*Sturnus vulgaris*) introduced into Australia, taking ants in their bills and sticking them deliberately under their wings, and also suggests that the object of this behaviour was to expel or kill the ectoparasites by means of the formic acid exuded by the squashed insects.

A number of very interesting notes on similar observations from readers of *Ornithologische Monatsberichte* followed the above communication by Dr. Stresemann, and these are published in the September-October issue of that *Journal* (pp. 134-8). Aggregately they indicate that without doubt this habit is widely and regularly practised by many species of birds, especially of the tropics.

Kleinschmidt refers to a short communication published in a sporting paper as far back as 1911, of a tame Magpie (*Pica pica*) eagerly seeking all available cigar stumps and rubbing them into its plumage. *Apropos* of this note, Dr. Heinroth observed at the time that Starlings do something similar with live ants and that a young Dipper (*Cinclus cinclus*) was seen by himself and his wife to catch the insects in the tip of its bill and rub them deliberately through its wing feathers. The ant was then dropped, a fresh one seized and the action was repeated on the feathers of the abdomen and thighs. It would be assumed, naturally enough, that the bird did so to get rid of vermin, but Dr. Heinroth further remarked that several young dippers taken by him from the nest and who could not have had a similar experience before, acted in precisely the same manner although no trace of any parasites could be detected on them, a fact which suggests that the reaction is wholly instinctive.

Other writers also recorded similar observations with crows and starlings, of these birds not only sticking the insects into their feathers, but literally 'bathing' in a swarm of ants. Herr Neunzig observed that caged *Leiothrix* and several species of *Garrulax* will even stick mealworms into their plumage. From this, Dr. Kleinschmidt speculates that it may perhaps be the pleasant sensation produced by insects crawling through their plumage—akin to that produced by stroking a bird's nape with the fingers, which it so obviously enjoys—that induces birds to behave in this manner.

One correspondent mentions that his tame Carrion Crow (*Corvus corone*) 'bathes' as often as it can in ant swarms with much apparent relish, one such bath lasting for 25 minutes! The bird gathers a number of ants in its bill, squashes them, rubs them through its plumage and then casts them away in the form of a pellet and gathers more. The same observations have been made with captive *Chloropsis* species and with the thrushes *Turdus musicus* and *T. philomelos*.

A. Troschütz is quoted as writing in *Gefiederte Welt* (1931, p. 484) as follows: A peculiarity which only some exotic birds (*Leiothrix lutea*, *Lioptila capistrata*, etc.) and the Thrushes have in common is their predilection for ants, not as food but for rubbing into their thighs, rump and wings. The formic acid has probably some beneficial effect, but whether it helps to eradicate parasites or acts as some form of general tonic is doubtful. In the case of his tame crow, at any rate, Herr Troschütz doubts if it can be the former, since the bird takes plenty of water baths and keeps itself scrupulously clean.

The notes published deal in all with the following species of birds, both captive and in a wild state: Magpie (*Pica pica*), Jay (*Garrulus glandarius*), Starling (*Sturnus vulgaris*), the crows *Corvus corone* and *C. cornix*, *Leiothrix lutea*, *Lioptila capistrata*, *Garrulax* spp., *Chloropsis* spp., the thrushes *Turdus musicus* and *T. philomelos* and the Dipper (*Cinclus cinclus*).

Besides ants, which are regularly and deliberately rubbed through the plumage by all of them, there are other things which have also been observed to be similarly utilised. Cigar ends and mealworms have been mentioned before, and 'Flohkrebs' (?) and many acid fluids such as lemon-juice and vinegar are among the others.

Formic acid—first discovered by Rey in 1670 by distilling red ants (*Formica rufa*)—is well known to be a powerful antiseptic, and ants rubbed into the feathers of a bird would indeed effectively rid them of noxious insects as has been generally suggested. Mealworms and 'Flohkrebs' (evidently some sort of caterpillars?) require closer investigation, although it is known that formic acid is also formed in the acid secretions of certain caterpillars.

Tobacco-juice or decoction is commonly sprayed by gardeners to ward off insect pests and is also widely and effectively used by jungle people to deter leeches from climbing up their legs and for dropping off partly satiated ones. Moreover, it is common knowledge that a slice of lemon rubbed on to the arms, neck etc. will discourage bites of mosquitoes and sandflies (*Culicidae* and *Psychodidae*) and it seems very probable that lemon-juice (*citric acid*) may have a similarly repellent action on lice (*Mallophaga*), ticks and other ectoparasites of birds. It is not difficult to conceive, therefore, that in the above cases, the cigar-ends, lemon-juice, vinegar etc. may all have been instinctively employed by the birds for this purpose although the immediate need was not apparent.

As Dr. Stresemann points out in his summing up, however, the assumption that the ridding of parasites is the real object of this behaviour is merely a conjecture so far, albeit a very plausible one. It is hoped that this note will provoke further observation and experiment.

Curiously enough in none of the observations referred to is there a suggestion that the ants were *eaten* by the birds at the time or after being rubbed through the feathers, and in this Humayun Abdulali's note differs from the rest. Ants in varying degree form the food of so many bird species in India that there is nothing remarkable about this part of his observation, but the effect of formic acid taken internally is of some interest. Taken by mouth or hypodermically, it is said to give tone to the muscles, increase muscular energy and abolish the sense of fatigue.[1] The Stinging Nettle (*Urtica dioica*) which also contains formic acid, has long been employed as a tonic and diuretic, and it may be for this and the other beneficial properties that red ants are eaten by the Santāls, a typical Dravidian tribe of Chōta Nāgpūr.[2]

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[1] Martindale and Westcott, *The Extra Pharmacopeia*, 19th edition, 1928, vol. i, p. 34.

[2] Sir George Watts, *Dictionary of Economic Products of India*, vol. i, p. 264.

In addition to formic acid, ants also contain a small amount of formaldehyde and at a certain stage these may be chemically acted upon by the gastric secretions of the bird and converted into glucose which is a very valuable food material. It is conceivable also that at times the formic acid from the squashed and swallowed ant may have the effect of ejecting endoparasites with which we know birds are commonly afflicted.

Dr. Stresemann suggests the use of a special term for this 'rubbing in' process on a par with preening which may be translated into English, and henceforth used, as 'anting',—e.g. a bird ants itself or its feathers, even when objects other than ants (necotine, lemon-juice, mealworms etc.) are used in the process.

Dehra Dun. SĀLIM ALI.
November 11, 1935.

XXVI.—GECKOS AND SUPERSTITION.

Many reptiles have given rise to superstitious notions the world over, and lizards have also made their contribution in this direction. Having been engaged in the preparation of a detailed memoir on the common Indian wall-lizard (*Hemidactylus flaviviridis* Rüppel) for the last two years, I have been much interested in the prevalent superstitions about geckos. Some of the results of my search are given below.

Flower[1] says, ' "Bors", or "Abu Bors", is, as it was in the time of Forskaal, the common name for any Gecko in Egypt. Better-informed people may tell you that it is "Abu Borîs", to fit better with the words used by Damiri, "Abou Baris" (Jayakar's translation, *1*, p. 352) and "Sâm Abras" (o.c. *2*, p. 23), meaning respectively "Father of leprosy" and "Poison of a leper." Damiri wrote: "One of the characteristic qualities of this animal is that, when it settles down in salt, it rolls about in it, giving rise to what becomes the means of producing white leprosy."

'It should be mentioned that some of the desert Arabs, who know more about lizards than the Fellaheen do, include under the term "Bors" the Red-spotted Lizard *Eremias rubropunctata*: I do not know why. They believe in poisonous and non-poisonous lizards: a non-poisonous lizard may be known by its running fast for a short distance and then stopping suddenly—for it has remembered it has no poison!'

The bite of house-geckos is generally, though erroneously, regarded as poisonous and Roberts[2] describes ten native remedies for it. Even the saliva[3] of these creatures is believed by some people to be highly emetic. According to an article in *Encyclo-*

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[1] Flower, S. S., 'Notes on the Recent Reptiles and Amphibians of Egypt, with a list of the Species recorded from that Kingdom.' (*Proc. Zool. Soc.*, 1933, pp. 742-3.)

[2] Roberts, E., 'Native Remedies used in Snake-Bites, etc.' (H. W. Cave & Co., Colombo, 1919, pp. 41-3.)

[3] Prof. N. M. Antani, St. John's College, Agra, tells me that the dropping of a house-lizard's saliva in milk is believed by the people of Gujarat to make the latter highly poisonous.

paedia Britannica,[1] the saliva is supposed 'to produce painful cutaneous eruptions'; and even the touch of geckos 'was thought sufficient to convey a dangerous taint'. In almost all places in India, the touch of a house-lizard is believed to be polluting in effect and there are people who attribute this reptile to the pariah or 'sweeper' caste.

The following explanation[2] of this popular disfavour sounds plausible: 'With the head considerably flattened, the body short and thick, the legs not high enough to prevent the body from dragging somewhat on the ground, the eyes large and almost destitute of eyelids, and the tail short and in some cases nearly as thick as the body, the geckos altogether lack the litheness and grace characteristic of most lizards. Their colours also are dull, and to the weird and forbidding aspect thus produced the general prejudice against these creatures in the countries where they occur, which has led to their being classed with toads[3] and snakes, is no doubt to be attributed.'

In India, both the sound produced by a house-gecko and its falling on the human body are supposed to be predictive in nature. Several Indian almanacks give accounts of the consequences to be expected if a lizard produces sound from this or that direction, or happens to fall on a particular part of the body. The following quotation[4] is an example:

'If the house-gecko (*Tiktiki*) makes a sound from above, acquisition of money is expected; from the east, immense success; from the south-east, fear; from the south, fear of fire; from the south-west, quarrel; from the west, profit; from the north-west, fine clothes and scented water; from the north, gain of goddess-limbed woman; and from the north-east, death. The same consequences can be expected from sneezing.

'If the house-lizard falls on the right side of the body, there will be loss of relatives and money. On the left side, profit. On chest, forehead, back and throat, gain of kingdom. On arms, legs and heart, happiness.'

Tamil almanacks,[5] however, are far more detailed in this respect. In them, the consequences to be expected from a gecko's sound depend not only on the direction from which the sound is produced, but also vary from day to day in the week. The parts of the body on which the lizard may fall are mentioned in great detail, and the consequences also appear to be better discriminated. The list consists of as many as forty-five anatomical regions.

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[1] 'Gecko' (*Encycl. Brit.*, 11th. ed., 1911, xi, pp. 546-7).

[2] *Op. cit.*, same pages.

[3] Cf. Shakespeare's *Macbeth*, IV, i, ll. 12-19:

'Fillet of a fenny snake,
In the caldron boil and bake;
Eye of newt and toe of frog,
Wool of bat and tongue of dog,
Adder's fork and blind-worm's sting,
Lizard's leg and howlet's wing,
For a charm of powerful trouble,
Like a hell-broth boil and bubble.'

[4] From *Gupta Press Directory Panjika* (Bengali), 1935-36, p. 41 (published by Gupta Press, Calcutta). The passage was translated by Mr. J. C. Banerjee, to whom I am thankful for it.

[5] I have consulted *Anand Bodhini*, 1933, edited by C. G. Rajan, B.A. Mr. C. S. Krishnamurti who kindly translated the necessary passages for me, tells me that exactly the same sort of thing is mentioned in other Tamil almanacks also and that there is no change in this portion from year to year.

Why is the gecko's sound regarded as prophetic? Here is an interesting explanation:[1]

'The God Boar cut off the tongue of Khona Saheb and stood guarding it in a secret place. The lizard came, thought that it was an article of food and devoured it. Since then, the sound of a house-lizard can bring the facts of past and future to light.' Obviously, Khona Saheb was a great prophet himself!

One should like to know, however, why the fall of the house-lizard on the human body comes to have predictive value. Perhaps some member of the Bombay Natural History Society can enlighten us on this point!

ST. JOHN'S COLLEGE,
AGRA.
August 20, 1935.

B. C. MAHENDRA.

XXVII.—THE NOTODONTID MOTH *DUDUSA NOBILIS* WALKER.

In vol. xxxviii, No. 1, Mr. T. R. Bell gives an interesting account of the early stages of the above moth.

It might interest Mr. Bell and other members of the Society to know that I have a pair of these moths in my collection and which were caught in the house which to my mind proves they 'are attracted by artificial light'. I mention this as Mr. Bell says they are certainly not.

This moth is fairly common in Upper Burma as I have seen many on the wing but only cared to collect a pair. If I have an opportunity to collect others I shall be glad to send Mr. Bell a specimen or two for comparison with his own bred ones.

Unfortunately I did not at the time record the date of capture.

MAYMYO,
BURMA.
September 4, 1935.

W. C. CARROTT,
Captain.

XXVIII.—OCCURRENCE OF *UNKANA ATTINA* IN THE TEESTA VALLEY.

When collecting in the Teesta Valley below Kalimpong (Darjeeling District), I captured a ♂ *Unkana attina* on 8th September 1934, flying at about 1,000 ft. in shady jungle. I identified it by Brigadier-General Evans' *Identification of Indian Butterflies*, and was surprised to see that it had hitherto apparently not been taken further north than Bassein.

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[1] *Gupta Press Directory Panjika*, 1935-36, p. 76.

Recently I had the good fortune to be able to show it to Brigadier-General Evans in the South Kensington Museum, who confirmed my identification, and added that my specimen was distinctly darker than any of the series in the Museum, which show a progressive darkening towards the north. This seems to indicate that this butterfly may be found sparingly throughout the intermediate region and have an alternative to its normal food-plant, the cocoa-nut palm, which is not found in the Kalimpong district.

On the other hand as the district has been so extensively worked by collectors, and the butterfly itself is so large and distinctive, consideration must be given to the possibility that it may have been accidentally imported in the pupal stage in a crate of cocoa-nuts.

South Kensington,
London, S.W.
July 20, 1935.

JOHN ELIOT,
Lieutenant, R.A.

XXIX.—ON THE PRESERVATION OF *HETEROCERA* IN INDIA.

Collectors of Butterflies are far more numerous in India than those of Moths, the reasons usually advanced being that the *Heterocera* are more difficult to identify and preserve.

The first of these reasons has a certain foundation, the only general books that are easily obtainable being Hampson's Moths in the *Fauna of British India* and the three Indo-Australian volumes in Seitz's *Macrolepidoptera of the World*. Hampson is now out of date and incomplete and Seitz, which is still in course of publication, does not include the *Pyralidae*.

The excuse regarding preservation, however, is completely unfounded and the following account of how I deal with my specimens may be of help to other collectors. In the first place I must make it clear that I set nothing in India, all my specimens being papered and sent to Europe.

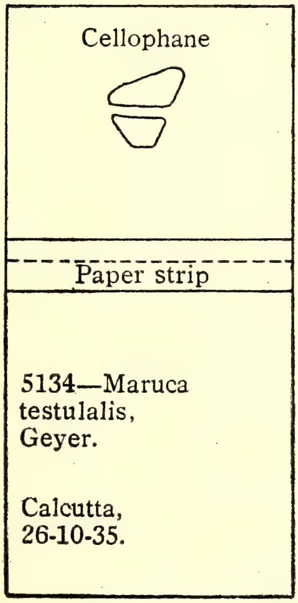
After killing the moth with cyanide, I paper it in exactly the same way as I would a butterfly, the envelope bearing the usual data in pencil. I keep the papered specimens in a large cigaratte drying bottle, the drying pad being exchanged for a wad of cotton soaked in creosote as a preventive against mildew. I never eviscerate even the largest species and, except for an occasional specimen becoming greasy, I have never had the slightest trouble. As soon as I have accumulated a couple of hundred insects, I pack them securely and post them to London, where they may remain for two or three years before being relaxed and set.

For relaxing I use methylated spirit. The papers and their contents are damped with the spirit and are then shut up in an air-tight tin for a couple of days. The insects will then be perfectly pliable and ready for setting and can be removed from the setting boards after twenty-four hours. Hairy-bodied species should not be damped, as this leads to the matting of the hair on the thorax and abdomen, but should be exposed to the fumes of a mixture of spirit and water. It is important to write all data on the envelopes in ordinary lead pencil; ink or copying pencil is affected by the spirit and will cause stains on the insects inside the papers. I have employed this method with great success on the largest *Saturniidae* and the smallest *Pyralidae*.

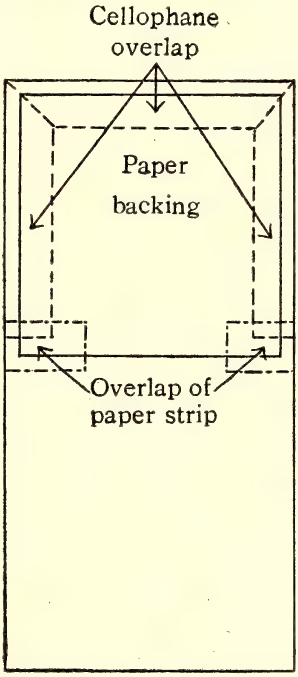
For reference in India, I keep a series of wings mounted on cards. These are prepared as follows:

Take a suitable piece of card, I use small visiting cards, and cut a piece of Cellophane large enough to cover from a third to a half of the card, depending on the size of the wings to be mounted, and to overlap each side and the end. The two wings of one side are then cut off as close to the base as possible, a thin film of good paste such as Gripfix is brushed over the card, the wings are placed in position and the whole covered with the Cellophane and pressed down. The overlaps are turned over and pasted to the back of the card, a thin strip of paper is pasted over the free edge of the Cellophane to prevent it coming away from the card and a small square of paper is pasted over the back of the mount to prevent it warping with changes in humidity. The usual data is written on the exposed half of the card. I have found it convenient for comparison to make all mounts with wings from the same side, either right or left is immaterial. If the markings of the underside are of importance, a wing can be mounted to show this aspect also.

The appearance of the finished mount is shown below.



Front.



Back.

Papered specimens are very difficult to examine and I have found these mounts extremely useful in two ways. They enable local variation to be recognised at once and also serve as a basis when identifying one of a group of allied species, especially those where Hampson's description reads 'As . . . but lines more oblique.'

CALCUTTA. D. G. SEVASTOPULO, F.R.E.S.
October 28, 1935.

XXX.—ON THE FLOWERING OF *STROBILANTHES* IN 1934.

Very little has been known about the periodical flowering of the numerous species of the genus *Strobilanthes* and M. E. Robinson's record of the flowering of a few of them in 1934 in No. 1, vol. xxxviii of the *Journal,* is a useful contribution. As I travelled through Coorg, Wynaad and Nilgiris in September 1934 I am able to add the following species which were found flowering in addition to those mentioned by M. E. Robinson.

S. heyneanus Nees, was found in flower in jungles in Coorg and Wynaad. Gamble says it is often found in flower.

S. cuspidatus T. And. was found on the sides of hills in Gudalur. Gamble says that it was collected in flower in 1851, 1870, 1877, 1884 and that its period seems to be about 7 years.

S. sessilis Nees, was flowering very copiously all over the hills behind Naduvattam overlooking the Ouchterloney Valley. This hill is locally known as the Gudalur malai as it overlooks the town of Gudalur on the other side. It is a very pretty plant in flower and grows and flowers gregariously. Gamble says it probably flowers almost every year or at any rate at short intervals. I also found this plant in flower in the same locality in May 1933, but am not able to say whether it flowered profusely in that year as it did in 1934.

Before concluding this note I might mention that I found *S. consanguineus* C. B. Clarke, in bloom on the sacred hills of Tirupati in March 1927. This is a new locality for this plant as it has been so far known only from the Western Ghats.

Little is known about the flowering of *S. warrensis* Dalz. It has been reported from South Canara and Coorg. I collected this species on the lower slopes of the High Range, Travancore, above Neriamangalam in December 1933 but then the flowering season was over and I could gather only dry spikes.

Lovers of plants who happen to collect any species of *Strobilanthes* in flower may send them to the writer who will be glad to identify their specimens for them. The planting community can do much towards establishing the periodicity of their flowering.

BOTANY DEPARTMENT, P. V. MAYURANATHAN.
GOVERNMENT MUSEUM, MADRAS.

PROCEEDINGS OF THE ANNUAL MEETING OF THE BOMBAY NATURAL HISTORY SOCIETY.

The Annual General Meeting of the Society was held at the Prince of Wales' Museum on Monday the 9th March 1936 at 6-15 p.m. The Hon'ble Mr. Justice K. W. Barlee, I.C.S., was in the chair.

AGENDA.

1. Reading of the Annual Report of the Committee.
2. Presentation of the Balance Sheet and Statement of Accounts for the past year.
3. Election of the Committee.

Mr. P. M. D. Sanderson, Honorary Secretary, announced the election of the following thirty new members since the last meeting:

Mr. A. N. Moos, Bombay; Lt.-Col. J. D. Deane-Drummond, Nilgiris; Mr. B. E. Smythies, B.F.S., Rangoon; Mr. P. G. Chapman, Burma; Major J. H. L. Hindmarsh, Delhi; Mrs. M. Parker, Bandra; Mr. F. J. Mustill, I.F.S.; The Librarian, Imperial Secretariat Library, New Delhi; Mr. E. Jenning, Upper Burma; Mr. G. P. Walden, Upper Burma; Mr. L. J. Vernall, Upper Burma; The Honorary Secretary, Rangoon Literary Society, Rangoon; Major D. A. Tapp, Belgaum; Mr. J. E. Gardiner, Bombay; Capt. J. M. Ferguson, Deccan; Mr. K. D. Kothawala, Ahmedabad; Mr. E. J. H. Jacobson, Calcutta; Mr. F. C. Badhwar, Calcutta; Mr. Noel Exshaw, France; Mr. E. J. Langleson, Bombay; Mr. H. E. Burgess, Nilgiris; Mr. Mg Tun Yin, B.A., Rangoon; The Economic Botanist, Bengal; Mr. M. R. Gokaru, Kalyan; Mr. D. Willis Fleming, Assam; Miss Winifred H. Baker, Lahore; Rev. M. G. Champion, Roorkee; Capt. G. McElligot, M.R.C.V.S., Bombay; Mr. U. B. H. Dunbar, Burma; and Mr. Jal N. D. Tata, Bombay.

The following proposals were accepted:—

Vice-President.—Rev. Fr. J. F. Caius, S.J., in place of the late Rev. Fr. E. Blatter, S.J.

Executive Committee.—Mr. H. D. Ash, in place of Major S. L. Bhatia, I.M.S., who does not attend meetings.

Advisory Committee.—Two names to be struck off the roll, i.e. Lt.-Col. F. C. Fraser, I.M.S., and Lt.-Col. C. H. Stockley, D.S.O., who have left India.

BOMBAY NATURAL HISTORY SOCIETY.

OFFICE BEARERS—1936.

Patron.—His Excellency The Viceroy of India.

Vice-Patrons.—H. H. The Maharao of Kutch, G.C.S.I., G.C.I.E.; H. H. The Maharaja of Jodhpur, K.C.S.I., K.C.V.O.; H. H. The Maharaja of Rewa, K.C.S.I.; H. H. The Maharaja of Bhavnagar; H. H. The Maharaja or Travancore; Mr. F. V. Evans, Liverpool; Sir David Ezra, KT., F.Z.S., Calcutta; Mr. A. S. Vernay, New York and London; Lt.-Col. K. G. Gharpurey, I.M.S. (Retd.).

President.—H. E. The Right Hon'ble Lord Brabourne, G.C.I.E., M.C.

Vice-Presidents.—H. H. The Maharao of Kutch, G.C.S.I., G.C.I.E.; The Hon'ble Sir Robert Bell, K.C.S.I., C.I.E., I.C.S.; Rev. Fr. J. F. Caius, S.J.

Executive Committee.—Right Revd. R. D. Acland, Bishop of Bombay, Mr. H. D. Ash, Mr. Farrokh E. Bharucha, Mr. C. B. B. Clee, I.C.S., Sir Alwyn Ezra, KT., F.R.G.S., F.Z.S., Mr. J. B. Greaves, M.L.C., Lt.-Col. S. S. Sokhey, I.M.S., Mr. A. Forrington (*Honorary Treasurer*), Mr. H. McGusty, Mr. P. M. D. Sanderson, F.Z.S. (*Honorary Secretary*), Bombay.

Avisory Committee.—Dr. C. F. C. Beeson, D.SC., M.A., I.F.S., Dehra Dun; Mr. T. R. Bell, C.I.E., I.F.S. (Retd.), Europe; Lt.-Col. R. W. Burton, I.A. (Retd.), Coonoor; Mr. C. H. Donald, F.Z.S., Dharmsala; Dr. F. H. Gravely, D.SC., Madras; Mr. S. F. Hopwood, I.F.S., Rangoon; Mr. C. M. Inglis, M.B.O.U., F.Z.S., Darjeeling; Mr. R. C. Morris, F.R.G.S., F.Z.S., Coimbatore;

Major E. G. Phythian Adams, F.Z.S., I.A. (Retd.), Nilgiris; Dr. Baini Prashad, D.Sc., Calcutta; Mr. H. C. Smith, I.F.S., Maymyo; Mr. J. H. Williams, Coimbatore.

ANNUAL REPORT OF THE BOMBAY NATURAL HISTORY SOCIETY. FOR THE YEAR ENDING 31ST DECEMBER 1935.

ADMINISTRATION.

President.—H. E. The Right Hon'ble Lord Brabourne, G.C.I.E., M.C.

Vice-Presidents.—H. H. The Maharao of Kutch, G.C.S.I., G.C.I.E.; The Hon'ble Sir Robert Bell, K.C.S.I., C.I.E., I.C.S.

Executive Committee.—Right Revd. R. D. Acland, Bishop of Bombay, Mr Farrokh E. Bharucha, Major S. L. Bhatia, I.M.S., Rev. Fr. J. F. Caius, S.J., Mr. C. B. B. Clee, I.C.S., Mr. Alwyn Ezra, F.R.G.S., F.Z.S., Mr. J. B. Greaves, M.L.C., Mr. H. McGusty, Mr. J. G. Ridland, Lt.-Col. S. S. Sokhey, I.M.S., Mr. A. Forrington (*Honorary Treasurer*), Mr. P. M. D. Sanderson, F.Z.S. (*Honorary Secretary*), Bombay.

Advisory Committee.—Dr. C. F. C. Beeson, D.Sc., M.A., I.F.S., Dehra Dun; Mr. T. R. Bell, C.I.E., I.F.S. (Retd.), Karwar; Lt.-Col. R. W. Burton, I.A. (Retd.), Coonoor; Mr. C. H. Donald, F.Z.S., Dharmsala; Lt.-Col. F. C. Fraser, I.M.S., Coimbatore; Dr. F. H. Gravely, D.Sc., Madras; Mr. S. F. Hopwood, I.F.S., Rangoon; Mr. C. M. Inglis, B.E., M.B.O.U., F.Z.S., Darjeeling; Mr. R. C. Morris, F.R.G.S., F.Z.S., Coimbatore; Major E. G. Phythian Adams, F.Z.S., I.A. (Retd.), Nilgiris; Dr. Baini Prashad, D.Sc., Calcutta; Mr. H. C. Smith, I.F.S., Burma; Lt.-Col. C. H. Stockley, O.B.E., D.S.O., M.C., Meerut; Mr. J. H. Williams, Coimbatore.

Staff.—S. H. Prater, M.L.C., J.P., C.M.Z.S. (Curator); C. McCann, F.L.S. (*Assistant Curator*).

THE HONORARY SECRETARY'S REPORT FOR THE YEAR 1935.

THE SOCIETY'S JOURNAL.

The Thirty-seventh Volume of the *Journal* was completed and two parts of Volume XXXVIII were issued during the year.

Birds :—

Survey of Eastern Ghats.—The more important scientific papers published during the year include the reports on various Ornithological Surveys. Messrs. Kinnear and Whistler continued their reports on the Vernay Scientific Survey of the Eastern Ghats, parts X, XI and XII of which were published. The authors deal with the Parrots, Bee-eaters, Kingfishers, Hornbills, Swifts, Nightjars, Owls and Vultures which occur in the Madras Presidency, and comment on their status and distribution.

Travancore and Cochin.—Parts I, II and III of the Ornithology of Travancore were published during the year. The papers are based on a Survey of the States of Travancore and Cochin, carried out by the author Mr. Salim A. Ali in 1933. Since the publication of Hume's and Ferguson's papers on the birds of Travancore a considerable advance has been made in our knowledge of the avifauna of the Peninsula of India notably through the recent surveys in the Eastern Ghats and Hyderabad State. The Survey of Cochin and Travancore was specially undertaken to link up with the surveys in neighbouring areas and so complete the data available. In his Introduction, the author makes a special plea for greater concentration on the study of birds in relation to their environment. Every student with an observant eye and an enquiring mind can make some contribution. A great many biological problems await solution by the intensive study of animal life in its environment, and such study can now be recommended to bird lovers in India. It is recommended as being of far greater importance and potentiality than the mere collection and labelling of skins.

Sittang Irrawaddy Plain.—In Volume XXXVII, No. 4, we published Mr. Stanford's note on the Birds of the Sittang Irrawady Plain. Since Oates published his *Birds of British Burma* in 1883, practically no one has collected in the huge area which lies between the mouth of Sittang on the East and the hills which fringe the western side of the Prome, Henzada and the Bassein

Districts. Mr. Stanford's collections in this area were identified by Dr. Ticehurst who contributed his notes to the paper which lists 291 species, 3 of which are new to Burma.

Central Provinces.—Mr. E. A. D'Abreu, Curator of the Nagpur Museum, published a paper on the Birds of the Central Provinces, based on collections and observations carried out over a period of 20 years. His paper is a revision of his list published in 1923 to which many alterations and additions have become necessary.

Chittagong.—A paper on the Birds of Chittagong was written by Capt. R. S. P. Bates based on observations made during a period of three months, March-May 1934. Capt. Bates also contributed a paper on the Nesting Habits Habits of Some Indian Birds illustrated with the fine photographs which usually accompany his articles.

Fishes.—*Fishes of Afghanistan.*—In 1933 we published a paper by Dr. Sunder Lal Hora on the Fishes of Afghanistan. During the year under review we were able to publish a second paper by the same author on the fishes of this little known area. The paper is based on a collection made by Sir Richard Maconachie, Major A. E. Farwell and Capt. E. W. Fletcher. The thanks of the Society are due to these gentlemen for their very valuable collection, the study of which has helped us to a better knowledge of the precise specific limits of McClelland's hitherto ill-defined species from this country. In Volume XXXVII, No. 4, Mr. John Berry, of the Natural History Department, University College, Dundee, described an interesting case of semi-cyclopia in a shark (*Charcharias dussumieri*). The monstrosity was obtained by the Raffles Museum, Singapore.

Snakes.—Dr. S. G. Tscherbakoff wrote a paper on the feeding of cobras in captivity based on observations of 319 specimens kept in the Serpentarium of the Haffkine Institute, Bombay. Various experiments were conducted relative to the method of feeding and housing of cobras in captivity. The results will be conducive to reducing the high rate of mortality among these snakes for whose venom there is an increasing demand from medical research workers.

Col. K. G. Gharpurey, I.M.S., contributed a paper on the Snakes of Belgaum which supplemented his previous note on the snakes of this area.

Insects.—Part III of Mr. Martin Mosely's paper on Indian Caddis Flies was published during the year. The series of articles when complete will form the standard work on Indian Trichoptera. Articles on Butterflies included Major Ghosh's paper on the Butterflies of Nepal, based mainly on 3 months collecting in the Nepal Valley. The paper provides a nucleus on which a complete list of the Butterflies of this unknown region may be built up. Col. Logan Homē wrote on the Butterflies of Secunderabad and its surroundings, and listed 70 species obtained within this area. The Butterflies of the Nilgiri District, a popular area among collectors, were listed in a paper by Mr. J. A. Yates. The author revises and supplements Sir George Hampson's List published in the *Journal of the Royal Asiatic Society* in 1888. Lt.-Col. F. C. Fraser described a new Drangonfly from Burma; and Mr. T. R. Bell the Notodontid Moth (*Dudusa nobilis*) and its early stages. Mr. Mathew's interesting paper on the life history of the Plant Bug (*R. pedestris*) traces the development of the species and shows how in the early stages the nymphs exhibit close resemblances to different species of ants. The ant-mimicking is gradually lost in the subsequent moults and disappears completely in the adult. The Californian Red Scale Insect (*C. auranti*), a serious pest of citrus plants in many parts of the world, is recorded by Mr. P. M. Glover as attacking Grape Fruit grafts recently imported into India, the attack was not very heavy but of sufficient intensity to warrant control measures. In the same paper Mr. Glover records an instance of the Lac Insect as a pest of Grape Fruit. A resin spray was found effective in the control of both these coccids.

Botanical papers include 'The Revision of the Flora of the Bombay Presidency'. Parts XXVI and XXVII were published during the year. The authors, the late Rev. Fr. Blatter and C. McCann, deal in these parts with the Cyperaceae.

The Medicinal and Poisonous Plants of India are being described by Rev. Fr. Caius. During the year the author dealt with 3 Orders—the Palms, the Ferns and the Sedges and gave data of the medicinal and poisonous properties

perties of the species mentioned. Father Caius also wrote a very interesting and readable monograph on the Papaya or Papaw Tree with notes on its cultivation, food value, medicinal uses and commercial possibilities. Mr. Robinson gives an account of the flowering of Strobilanthes on the hills of South India in 1934. Among the species referred to is *Strobilanthes Kunthianus* 'the great blue flower' of the Nilgiris which once in 12 years colours whole tracts of the hill sides with sheets of delicate blue. The author illustrates the article with fine pen and ink drawings of 7 species.

Popular Papers.—Among the popular papers published during the year was Mr. Stuart Baker's concluding article on Waders and Semi-Sporting Birds. The series which commenced in Volume XXXI, No. 2, will form a companion volume to his work on the Game Birds of the Indian Empire, 3 volumes of which have already been published by the Society. The thanks of the Society are due to the author whose writings, for so many years, have added much to the attractiveness of the *Journal.* Mr. Stuart Baker's recently published work on the *Nidification of Indin Birds* (4 volumes, Taylor & Francis, London) will be found of great interest to all bird lovers and students in this country. It replaces Hume's *Nests and Eggs of Indian Birds* which was till now the standard work on the subject. Members will be interested to know that Stuart Baker has now in preparation a book on Cuckoos—a fascinating subject on which he wrote a series of articles in the early volumes of the *Journal*, and which Col. Burton recently summarised in his paper on 'Cuckoo Lore'.

Parts XVII, XVIII and XIX of the serial on Beautiful Indian Trees were published during the year. Twenty-eight of our more conspicuous flowering trees have so far been described and illustrated in colour. It is proposed during 1936 to complete the series with description of 3 more species. The Committee have decided to issue this attractively illustrated serial in book form. Orders may now be registered for the book. The estimated cost to members is Rs. 9.

As usual the *Journal* contained a number of shikar articles. Notable among these was Vicomte Edmond de Poncins' Reminiscences of a 'Hunting Trip in the Sunderbunds' in 1892, Mr. Burgess' account of his 'Early Days in Malaya' and Mr. W. S. Thom's 'Experiences of hunting Rhinoceros in Burma'. In the rigid conditions of our day these records of veteran sportsmen who hunted and travelled in the more spacious times of the past make interesting reading.

There can be few places more likely to appeal to a lover of nature than a secluded Salt lick in some remote forest of Burma. Mr. Peacock describes his attempts to photograph Tsaine in these surroundings and illustrates his account with some fine production of his camera. Speaking of Salt licks brings us to the analytical investigation carried out for the Society by Rev. Fr. Caius into the composition of Salt licks. Samples of earth from 39 different salt licks have so far been chemically analysed by Fr. Caius and the results published. During the year, in response to enquiries and as a guide to those who wish to co-operate in the work, the author published an account of the procedure adopted by him in his analysis. Col. R. W. Burton, a very welcome contributor to the *Journal,* published an account of his visit to the Yala Game Sanctuary in Ceylon. The author has visited many sanctuaries in India and Burma but nowhere has he seen so much varied wild life in its natural state as in the Yala Sanctuary. For 36 years the animals in this sanctuary have multiplied in peaceful security; but, without the allotment by the Government of Ceylon of funds for providing increased grazing and water the animals in the sanctuary must inevitably suffer.

During the year the Society published Parts III and IV of the serial on the Wild Animals of the Indian Empire. The parts deal with the Beasts of Prey and cover the Cats and the Civets. In conformity with the previous parts, the serial is beautifully and profusely illustrated with numerous photographs and coloured plates. Once again the Society has to offer its thanks to Mr. F. V. Evans, whose continued generosity has made possible the publication of these articles. As a pendant to the serial we published articles by various authors on the problem of protecting wild animals in various parts of India and Burma. Those who contributed were H. C. Smith (Burma); R. D. Richmond and R. C. Morris (the Madras Presidency); Salim A. Ali (Hyderabad); Major Phythian Adams (Mysore).

In conclusion we should like to offer our thanks to the numerous members who contributed to the Miscellaneous Notes which make an important and very readable feature of the *Journal.* We should like to develop this section of the Journal and to print more articles of a popular nature so as to make our publication still more attractive to the general reader. We hope that members will continue to send us their observations and experiences which are often very valuable and always make interesting reading.

The Museum.—The new Natural History Wing of the Museum was completed during the year and the transfer of the collection to the new building was started in December. The work involves the breaking down of several of the large habitat groups, which were so much admired in the old wing. They will be resurrected in a far finer setting in the new wing and a larger number of new groups will be built. During the year an expedition to the Runn of Cutch was organised to acquire material for the building of a group illustrating the nesting habits of the Flamingo. The thanks of the Society are due to His Highness the Maharao of Cutch and Prince Vijayarajji for their generosity in meeting the considerable expense involved. We are also indebted to Capt. Steer Webster who conducted the expedition under the most difficult climatic conditions. As a result, ample material was obtained for the construction of a group which will form a beautiful and striking addition to the Bird Gallery. Mr. S. F. Markham who is on a tour of inspection of Museums in India on behalf of the Museums Association, inspected the New Museum and expressed himself as very pleased with the designing, lay out of the galleries and with the methods of exhibition which were being adopted in the Natural History galleries. He stated that when completed the Natural History section would be the finest of its kind in the East.

Revenue Account.—This account unfortunately shows a loss again this year. The deficit for the last three years was as follows:—

Year.		Deficit.		
1933	Rs.	2,451	8	9
1934	,,	4,847	8	9
1935	,,	5,655	12	0

Actual receipts this year were Rs. 26,847-7-11 as against the receipts of Rs. 30,050-7-7 in 1934, a decrease of Rs. 3,222-15-0.

This year's decrease in receipts is made up as follows:—

	1934.				1935.			
Subscriptions ...	Rs.	22,810	7	2	Rs.	20,409	6	10
Entrance fees ...	,,	820	0	0	,,	640	0	0
Sale of Journals ...	,,	1,605	0	0	,,	1,268	11	0

Balance Sheet.—The Society's investments are shown as per the last Balance Sheet or at market value whichever is the lower.

Life Membership Fees.—In 1935 the Society received Rs. 700 on account of Life Membership fees. This has been taken to increase the reserve for Life Membership fees. This account now stands at Rs. 48,200. Under our memorandum of association we have to maintain investments in excess of the total of our Life Membership fees. The market value of our investments exceed this figure considerably, as will be seen from the Balance Sheet.

Membership.—During the year 1935, 66 new Members, including 2 Life Members, joined the Society, and 61 members resigned.

The total number of members on the roll of the Society (excluding 195 Life Members) was as follows:—

31st December 1934	970
31st December 1935	973

In spite of the slight increase in membership as compared with 1934, there was a decrease in Revenue from subscriptions. This is partly due to the fact that Messrs. Lloyds Bank, who usually pay the subscriptions of Members for the ensuing year in the month of December of the previous year, have not done so for the year 1936. Thus the year 1935 is short of Rs. 1,720 in subscriptions, which went into 1934. The total number of members who paid their subscriptions for 1935 was 848 as compared with 908 in 1934. This shows a decrease in subscriptions of 60 members.

General.—The loss on last year was anticipated, and although the present financial position is sound, we cannot continue to work at a loss for very much longer. As will be seen from the Balance Sheet, we have surplus Assets made up from surplus revenue, etc., which form a Reserve Fund and although every economy possible has been effected for the coming year, it is most necessary to bring in new members. Any co-operation from present members in this respect would be greatly appreciated.

Staff.—The Committee wish to thank the Curator and his staff for the usual good work during the past year.

P. M. D. SANDERSON,
Honorary Secretary.

Mr. Prater then delivered a short lecture on the new Natural History Wing of the Prince of Wales' Museum and the plans for its development. Mr. Prater said that one of the main objects for which the Museum exists is popular education and entertainment, but 90 per cent of the visitors who came to the Museum came there purely for pleasure and so with the majority of visitors the message the Museum had to offer was lost, unless the Museum provided something to rouse their attention and hold their interest. The purpose of the Museum should be to lead people to better ideals and to offer them new points in a way which they could understand and appreciate. The appeal could be made more to the senses than to the intellect, but it could be made in such a manner that in addition to mere attractiveness it should offer food for thought, which was the first step to a higher and more intellectual ideal. There were many ways of telling the story of Nature. Their plan was to choose the beautiful way, the way which leads from an appreciation of its interest and beauty to an understanding of its meaning. We were living in a changing world, the stress and strain of modern life and the demand it makes on the time and attention of the wage-earner does not leave much time for intellectual pursuits or for such side issues as art or natural history. The democratic spirit of the age necessitated a change in the attitude of the Museums towards the public. The older Museums were autocratic, they were exclusive laboratories of science intended for scientists where the visiting public were looked upon as intruders. But modern conditions are bringing about a change in this policy. Museums are becoming more and more dependent on public support, on money voted by the people's representatives, and unless something was done for the people that support would not be forthcoming.

It has been more and more realised that if Museums which stand for the cultural development are to succeed in their mission it is necessary for them to alter their standards, to break down their aloofness and restraint—that attitude which looks upon the public as a nuisance—and to come down to a more sympathetic consideration of the people's wants. It is the duty of the Museum Curator to see that his Museum is worth being interested in, to give his Museum such vitality and pertinence that people will want to be interested in it, will want to visit it and will realise the advantage of supporting it.

Mr. Prater then proceeded to show what was being done in the new Natural History Wing of the Museum in furtherance of this policy, how the whole arrangement of the galleries, the show-cases and the exhibits were planned with a view to creating interest and rousing the attention of the layman. Suitable colour schemes were being adopted in the different galleries with a view to providing an attractive 'atmosphere'. The show-cases were being built and arranged to avoid that feeling of artificiality and cumbersomeness which makes so many over-crowded Museum galleries repellent. The The arrangement of exhibits on shelves was being done away with to avoid monotony in arrangement. The exhibits themselves were carefully prepared and selected so as to give the visitor a clear outline of the animal kingdom without confusing him with too much detail. Specially interesting to the layman would be the large number of habitat groups with scenic backgrounds illustrating the various phases of animal life. These groups make a direct appeal to people by their beauty, the appreciation of which was common to all. Nevertheless, when well designed and constructed each of them had a lesson to teach. Apart from illustrating animal life the groups would also illustrate various phases of Indian scenery from the deserts of Sind to the evergreen forests of Assam and the snow-capped peaks of the Himalayas.

In conclusion Mr. Prater said that Mr. Markham who had recently visited the new wing of the Museum expressed himself as very highly pleased with the plans of development and the methods of exhibition now being used in the natural history wing which he said when completed would be easily the finest of its kind in the East.

BOMBAY NATURAL HISTORY SOCIETY.

BALANCE SHEET AS AT 31st DECEMBER 1935.

LIABILITIES	Rs A P	Rs A P
Life Membership fees:		48,200 0 0
Donations for specific objects unexpended:		
Show Cases, Models of Fish &c. in Prince of Wales Museum—Account No. 1 ...	1,412 15 10	
Show Cases &c. in New Building, Prince of Wales Museum—No. 2.	18,932 11 0	
Special Journal Fund	3,823 4 0	
		24,168 14 10
Sundry Creditors:		
Printers of Journal	2,514 10 7	
For Expenses	250 0 0	
		2,764 10 7
Surplus Assets:		
Balance as per last Balance Sheet ...	30,008 13 2	
Add—Profits on sales of Securities ...	7,238 12 0	
	37,247 9 2	
Less—Loss on Revenue Account... ...	5,705 12 0	
		31,541 13 2
Total ...		1,06,675 6 7

ASSETS	Rs A P	Rs A P
Investments—At holding value or Market value on 31st December, 1935, whichever is lower:—		
Rs. 35,000 3½% Loan 1947/50 at 102¼% ...	35,787 8 0	
,, 15,000 5% do. 1945-55 at par ...	15,000 0 0	
,, 10,000 3% do. 1951-54 at 98% ...	9,800 0 0	
,, 14,000 4 Port Trust Bonds at 77% ...	10,780 0 0	
,, 15,000 4 % Improvement Trust Bonds at 76%	11,400 0 0	
,, 5,700 Govt. 5½% Loan 1938-40 at par	5,700 0 0	
,, 500 ,, 5% ,, 1945-55 ,,	500 0 0	
		88,967 8 0
Cash—		
With National Bank of India Ltd., Bombay	8,585 0 5	
With National Bank of India Ltd., London, £73-2-3 at 1/6	974 13 4	
On hand	150 0 0	
		9,709 13 9
Sundry Debtors:		1,229 6 0
Furniture:		
Balance as per last Balance Sheet... ...	1,652 0 0	
Less Depreciation	50 0 0	
		1,602 0 0
Publications, excluding Journals: As certified by Hon. Secretary	..	300 0 0
Game Books, Vol. III: Stock on hand as certified by the Hon. Secy.		705 9 0
Bird Charts and Albums Stock on hand as certified by the Hon. Secretary	...	1,563 10 3
Bates' Bird Lite: Stock on hand as certified by the Hon. Secretary	...	1,029 8 6
Butterfly Book: Stock on hand as certified by the Hon. Secretary	...	53 8 10
Beautiful Indian Trees: Stock on hand as certified by the Hon. Secretary	..	1,514 6 3
Total ...		1,06,675 6 7

Note.—A stock of 20,400 old Journals and the Valuable Research Collection and Library of 2,600 volumes have not been taken into acconnt on the Asset side of the Balance Sheet.

We have prepared the above Balance Sheet from the cash book and from the information given to us, and have verified the investments.

In our opinion, such Balance Sheet represents a true and correct view of the state of the Society's affairs according to the best of our information and explanations given to us.

BOMBAY, 2nd *March*, 1936.

(Sd.) A. F. FERGUSON & CO. Honorary Treasurer.

BOMBAY NATURAL HISTORY SOCIETY.

REVENUE ACCOUNT FOR THE YEAR ENDED 31st DECEMBER 1935.

	Rs A P	Rs A P		Rs A P	Rs A P
To Salaries	16,188 8 3		By Subscriptions	20,409 6 10	
,, Society's Contribution to Staff Provident Fund	1,610 4 0		,, Entrance Fees	640 0 0	
,, General charges	613 7 5		,, Sales of Journals	1,268 11 0	
,, Rent	2,436 0 0		,, Interest on Investments	3,629 10 11	
,, Stationery and Printing	426 4 0		,, Sales of Game Books, Vols. I & II ...	569 0 0	
,, Postage	1,154 15 6		,, Society's small Publications	330 11 2	
,, Library	359 3 6				26,847 7 11
,, Audit Fee	250 0 0		,, Balance of Expenditure over Income ...		5,705 12 0
,, Insurance	100 0 0				
,, Depreciation on Furniture	50 0 0				
,, Loss on Taxidermy Department ...	60 9 3				
,, Cost of Printing Journals	9,304 0 0	32,553 3 11			
Total ...		32,553 3 11	Total ...		32,553 3 11

PUBLICATION ACCOUNT FOR THE YEAR ENDED 31st DECEMBER 1935.

	Rs A P	Rs A P		Rs A P	Rs A P
To Stock of Bird Charts and Albums (1-1-35)	3,691 14 3		By Sales of Bird Charts and Albums ...	3,121 0 0	
,, Expenses during the year (1-1-35) ...	992 12 0	4,684 10 3	,, Stock on hand (31st December, 1935) ...	1,563 10 3	4,684 10 3
,, Stock of Butterfly Books (1-1-35)		333 8 10	,, Sales of Butterfly Books .. .. ,, Stock on hand (31st December, 1935) ...	280 0 0 53 8 10	333 8 10
,, Stock of Game Books, Vol. III (1-1-35) ...		1,011 9 0	,, Sales of Game Books, Vol. III ... ... ,, Stock on hand (31st December, 1935) ...	306 0 0 705 9 0	1,011 9 0
,, Stock of Bates' Bird Life (1-1-35) ...		1,106 0 6	,, Sales of Bates' Bird Life ... ... ,, Stock on hand (31st December, 1935) ...	76 8 0 1,029 8 6	1,106 0 6
,, Stock of Beautiful Indian Trees (1-1-35)...		1,514 6 3	,, Beautiful Indian Trees Stock on hand (31st December, 1935)		1,514 6 3

Dr. **Cr.**

INCOME AND EXPENDITURE ACCOUNT OF DONATIONS FOR SPECIFIC PURPOSES FOR THE YEAR ENDED 31st DECEMBER, 1935.

	Rs a p	Rs a p		Rs a p	Rs a p
Fund No. 1					
To Expenditure on Show Cases, etc. ...	2,689 7 6		By Unexpended Balance as per last Balance Sheet	2,402 7 4	
,, Balance carried to Balance Sheet ...	1,412 15 10	4.102 7 4	,, Donations for the Modeller's Salary, etc.	1,700 0 0	4,102 7 4
Show Cases Fund No. 2					
,, Expenditure on Show Cases in New Building	4,424 9 0		,, Unexpended balance for Show Cases in New Building as per last Balance Sheet	17,784 9 0	
,, Balance carried to Balance Sheet ...	18,932 11 0	23,357 4 0	,, Interest During the year	572 11 0	
			,, Donation during the year	5,000 0 0	23,357 4 0
Special Journal Fund					
,, Expenditure on Printing Plates, etc. ...	2,559 10 0		,, Balance as per last Balance Sheet in Special Journal Fund...	6,282 14 0	
,, Balance carried to Balance Sheet ...	3,823 4 0	6.382 14 0	,, Donations received during the year ...	100 0 0	6,382 14 0

BOMBAY, *2nd March, 1936.*

Examined and found correct.
(Sd.) A. F. FERGUSON & CO.
Chartered Accountants, Auditors.

(Sd.) A. FORRINGTON,
Honorary Treasurer.

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OF THE

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Members of the Expedition at Tumri Hka.

Left to right: R. C. Morris, A. S. Vernay, H. C. Raven, S. F. Hopwood.

SOME BEAUTIFUL INDIAN TREES.

The concluding article in this serial which will deal with the Padouk will appear in the next number of the *Journal*.—Eds.

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THE VERNAY-HOPWOOD UPPER CHINDWIN EXPEDITION.

BY

R. C. Morris, F.Z.S., F.R.G.S.

(*With 6 plates*).

As an introduction to an account of the Vernay-Hopwood Upper Chindwin Expedition of 1935 I cannot do better than quote Mr. Vernay's own words in the June Number of 'Natural History' (*the Journal of the American Museum of Natural History*).

'The plan to penetrate the Chindwin region of inner Burma grew out of a conversation that I had several years ago with Mr. S. F. Hopwood, Chief Conservator of Forests of Burma.

'At the time, we were collecting specimens in Lower Burma for the South Asiatic Hall of the American Museum of Natural History. Mr. Hopwood pointed out to me the exceptional rewards which this remote section would yield to a scientific expedition. The Chindwin River, or the "Mighty Chindwin" as he called it, wound through a country which in many parts was unknown, a region buried in dense jungle, unvisited by white men. Interest was added by the fact that a journey to this region would take one within the territory of the head-hunting Nagas.

'Thus the seed was sown. From time to time we further discussed the possibilities of an expedition, and later I took up the matter with members of the scientific staff of the Museum. When I was informed that no animals from the Upper Chindwin country were in the collections of the Museum and that such specimens were greatly to be desired, the importance of the undertaking became apparent.

'It was in December 1933 that Mr. Hopwood offered his help and also expressed his willingness to do all he could to further the objective, with the result that definite plans were made for the expedition to form in Rangoon early in January 1935.

'The personnel had been carefully chosen. We were fortunate in being able to have an old friend of mine, Mr. Randolph Morris,

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the "shikari" of Southern India; also Major Rowley, an experienced shikari and Mr. Charles McCann, Assistant Curator of the Bombay Natural History Society. And finally, a few months before the Expedition set out, Mr. H. C. Raven, Associate Curator of comparative and human anatomy at the American Museum, fortunately was able to join us. Mr. Hopwood accompanied the Expedition for a few weeks. The task of organizing fell chiefly to his lot, and the success of the Expedition is evidence of his thoroughness in these preparations.'

Mr. Vernay and Major Rowley arrived in Calcutta by the Imperial Airways Plane on the 4th January and we met at the Great Eastern Hotel. The Imperial Airways bus called for us at 4 a.m., and at 5-30 a.m. the plane left the Dum Dum Aerodrome for Rangoon. The route took us over the Sunderbans and then over the open sea until we sighted the coast of Burma at about 7-45 a.m. From the air the Sunderbans looked like a vast low-lying mass of swampy jungle cut up by numerous streams and channels. Landing at Akyab at 8-30 a.m. we breakfasted and left for Rangoon at 10 a.m. A squadron of Air Force planes took off for Rangoon and Singapore just ahead of us. Flying over the Arrakan Yomas we reached the Mingladon Aerodrome, Rangoon, at 12-45. Here we were met by Messrs. Hopwood and Raven. Mr. McCann of the Bombay Natural History Society had already preceded us to Nanyaseik, our first collecting point. Spending the next two days in Rangoon completing our outfit etc. we left by train for Mandalay on the 8th afternoon in a special self-contained Railway Officers' carriage. Arriving at Mandalay on the following morning we proceeded up the Irrawaddy river in a steam launch visiting the 'Great Bell' of Mingun, the world's largest or second largest bell, and the huge unfinished and ruined pagoda nearby. Detraining at Mogaung on the following morning we loaded our outfit on buses, including four cows and six goats for baits! and, after a tiring journey on an appalling road, arrived in the evening at Nanyaseik where Mr. J. K. Stanford, the District Commissioner of Myitkyina, and Mr. McCann, who had already been successful in collecting a number of specimens of mammals, met us.

An amusing incident occurred on the railway journey up to Mogaung from Mandalay. Hopwood's dog, we discovered, had been left behind at a wayside station soon after the train had started and the mail train was stopped to send back for it!

On the 11th and 12th all our stores and outfit were packed into 60 lb. loads for mules and we started collecting specimens, the mammals shot comprising squirrels, *Callosciurus sladeni*, *Tamiops*, *Tomeutes*, tree shrews and monkeys and quite a number of birds. McCann had already collected specimens of the above as well as of the Hoolock gibbon (*Hylobates hoolock*), two macaques and a male and female Barking Deer.

On January 13th 110 mules were loaded up and we left at 8 a.m. for Namting and Lonkhin (19½ miles). Including our interpreters, skinners, Burmese servants and the Yunnanese muleteers we were a party of fifty-eight. The skinners comprised

Mr. Stubbs, kindly lent to us by Mr. Stanford, Mr. Fernandez of the Bombay Natural History Society, and Mr. Gabriel Joseph lent to the expedition by the writer. Each muleteer had five mules under his control and very efficiently handled the mules were. The two leading animals were adorned with brilliantly coloured plumes of dyed goat's hair and a mirror in the harness to keep off the evil spirits. I think I am correct in saying that the hire paid *per* mule *per* month was Rs. 16-8-0. The assistance of Mr. Stanford was most valuable. The path to Namting and Lonkhin led through hills and valleys covered with dense evergreen jungle, 750 ft. above sea level at Namting and rising to nearly 1,300 ft. a few miles from Lonkhin. Dropping down to Lonkhin we pitched camp round the Rest House, perched on a knoll (850 ft.) on the bank of the Uyu river. In the evening two members of the party accompanied Mr. Stanford out after woodcock and secured a couple. Dense morning mists were a feature of both Lonkhin and Nanyaseik. Maximum and minimum temperatures recorded by Mr. McCann at Nanyaseik were in the region of 76° and 50° respectively. We continued our collecting at Lonkhin and traps were put out every evening. Efforts to secure a specimen of the White-winged Wood Duck were unsuccessful. As at Nanyaseik, there were large numbers of Hoolock gibbons, their howling in the mornings resound through these jungles. Very human as these gibbons are, it was hateful work shooting them for the collection. The minimum temperature at Lonkhin went down to 44° while the maximum during the day rose to 82°F. A young civet, *Viverra zibetha*, was secured near the bungalow and the traps yielded rats and tree shrews. A visit was paid to the Kansi Duwar's house in the village where we saw the very fine pair of elephant-tusks portrayed on page 486 of the *Bombay Natural History Society Journal*, vol. xxxvii, No. 2. The Kansi Duwar, the ruler of the Kansi State, was instrumental in clearing for us many miles of paths through the jungle from Lonkhin to Dalu (Taro) on the Tanai Hka (upper reaches of the Chindwin river). Journeys at night in dugouts were made up-river with 'jacklights' on our heads for anything we could secure for the collection, three owls and a nightjar being secured. Shooting rapids in the dugouts on our way back was not without excitement. On the 17th most of the party left for the Hpakan Jade Mines. Photos of scenes in the bazaar and at the Jade Mines were taken and that night we spent an hour or so in the streets of Hpakan. Most interesting it all was, not excepting the gambling tables both in the houses and out in the streets, the opium dens and other features typical of mining towns and camps. We all slept the night in the Hpakan Rest House and on the following morning, Stanford accompanied us over the mines again and further photos were secured. The methods used for pumping water out of the workings were most ingenious, long hollowed-out bamboos, with a bamboo piston covered with soft leather, being employed most efficiently as pumps. Most of the workings were on the Uyu river here, and every stone in the vicinity had been at one time or another turned over and examined. The workings were in no case of great depth and apparently the labourers employed by the owners of these workings received only their food with a share of the profits of any find. These mines are of special interest in that they are the only true green Jade Mines in the world, nearly the entire output being exported to China. Jade stones of other colours were shown to us in the most beautiful shades of mauve, pink, orange and blue; but none of these are of any real value. White jade we were informed is mined on the Yunnan border, and a form of soft green jade in Tibet. After buying some jade in the rough we returned to Lonkhin (14 miles) where McCann had carried on the good work of collecting, his bag including a crab-eating mongoose (*Herpestes urva*).

The following morning saw us marching to Tawmaw, about 12 miles from Lonkhin at an elevation of 2,700 ft. where we camped. The path led through dense forest for most of the way ascending at times over crests of over 2,000 ft. Gibbons were in evidence on all sides, and langurs. A few of the latter were collected. At Tawmaw are a number of disused Jade Mines and the houses of their owners, some of which are in charge of watchmen. That night four specimens of civets (three of *Arctogalidia leucotes*, a female and two young, and one of *Viverricula malaccensis*) were secured by the party with the aid of jacklights. A total eclipse of the moon occurred lasting a considerable time. During the night the minimum temperature recorded was 42° and the maximum during the day 76° and on the following night the minimum temperature was 39°. The Kachins brought in a number of peacock-pheasants and partridges and the party secured five specimens of *Callosciurus* and some birds.

On the 21st we moved camp to Mansun, a 12-mile march. The path led over crests of 3,000 ft. and through dense forest the whole way. The camp at Mansun (elevation 3,200 ft.), where our tents were pitched near a long Kachin's hut, proved most productive. Perched on a ridge and surrounded by dense evergreen and bamboo forest, Mansun was a most picturesque spot. Blister flies were bad here. Traps were laid out daily. The temperatures recorded were from 42° to 45° during the night and 76° to 78° during the day. The dew was very heavy. A number of gibbons, squirrels and birds were collected including a young baby gibbon captured alive, which however died later. Kachins brought in a few pheasants, frogs, snakes, crabs, a tortoise and a live adult bamboo rat. A baby stump-tailed monkey (*Macaca*), which McCann had procured from the locals at Lonkhin died here. Tracks of tiger being in evidence a couple of baits were put out.

Just as we were leaving for our next camp news came in that a tiger had killed one of the baits. The kill was visited and a machan prepared. Vernay and Raven sat up that night but with no result. In the meantime the rest of the party proceeded to the next halt, Kora, passing through the Kachin village of Hpala. The Kachins are very neat in their water supply arrangements. Bamboo-pipes are installed in many places and wooden stands erected for bamboo water containers. The path to Kora dropped down to the upper reaches of the Uyu river (1,000 ft.)

and rose steeply to Kora (2,600 ft.). We were met on the way by Kachin villagers who had already collected for us specimens of reptiles, mammals, birds and amphibians for which they were duly paid. Blister flies continued to be very bad and it was noticed that the legs and arms of the Kachin villagers were a mass of bites. The Kachins are most adept with their bows and clay pellets with which they shoot birds and squirrels. Specimens of silver and peacock-pheasants, partridges, squirrels, bamboo rats were brought in by the villagers on the 25th. A stump-tailed monkey was collected by a member of the party.

The Kachins like most jungle folk have a keen sense of humour and they appeared to derive great enjoyment from the frequent tosses members of the party took while collecting over the rough and tricky country.

Raven sat up over the kill at Mansun again that night but saw nothing of the tiger. Apparently a number of tiger are accounted for annually by trapping in Burma. One method is to plant bamboo stakes thickly on both sides and close up to a path frequented by tiger. The split half of a bamboo clapper, released by the tiger coming into contact with a cord tied across the path, springs back against the other half with a loud report and apparently causes the tiger to jump to one side and so impale itself on the bamboo stakes! The jungle around Kora is very dense, chiefly bamboo. Both here and in the Mansun and Tawmaw jungles a feature of the forest is the large number of a gigantic species of *Dipterocarpus* with a scaly bark. One of them had a girth of 24 ft. 7 in. with a clear trunk reaching 150 ft. up to the lowest branches. On the 26th, five specimens of the stump-tailed monkey, including a young, were secured, a very welcome addition to the collection. The digging out of a bamboo rat by Kachins was witnessed and proved most interesting. The Kachins brought in many specimens. On the following day three more stump-tailed monkeys were collected, also a giant squirrel. A large part of the area traversed was *taungya* (abandoned cultivation) and here a number of bison and sambhur tracks were in evidence and also those of pig.

The Kachins in these parts are neither good trackers nor tree-climbers and we often had great difficulty in keeping them from conversing in loud tones while out collecting.

Some fine specimens of *Lobelia* were in flower in the *taungya*.

The minimum temperature during the night was in the region of 50° to 51° and the maximum during the day about 74°.

On January 28th camp was moved to Pumsin, the path dropping down to 1,900 ft. from Kora to the Kum Hka and rising at the village of N'bung Hku to an elevation of 3,150 ft. From here the path ascended at Pumsin to 3,900 ft. Gibbons were collected and a young gibbon about a year old captured alive. The country round Pumsin is steep on all sides. The Kachins erect bamboo benches where their main paths top hills and ridges, a most convenient and thoughtful habit. Some of the Kachin women in the village of N'bung Hku wear large cylindrical pieces of amber in their ears. Violets were growing all round our camping ground at Pumsin and in the jungles round about, as also at Mansun and Kora, there are a large number of fish-tailed palms. One of them was cut down by the Chinese muleteers, which very nearly led to trouble with the Kachin villagers, as these palms are considered sacred. The Kachin headman demanded Rs. 30 in compensation but was eventually satisfied with Rs. 2! From our camp we had a wonderful view of vast chains of forest-covered hills, while away in the distance lay the Naga Hills, the region we were heading for. Our collection was being rapidly increased. Mammals, birds and reptiles were secured by the party and brought in daily by the Kachins, while Raven took plaster casts of the villagers' faces and feet. The forest was chiefly bamboo interspersed with patches of evergreen trees. A brush-tailed porcupine was brought in, and traps yielded tree shrews (*Tupaia*) and rats. The minimum temperature in the night was in the region of 50° and the maximum during the day was 80°. The Kachin headman of Pumsin, a villainous-looking individual bore on his face the scar of a *dah* slash and he had one finger missing. On January 30th we struck camp and marched to our next halt at Tasu Bum. The path rose to 4,000 ft. and then dropped down through dense forest of bamboo and *taungya* to a stream at 2,900 ft. Ascending from here to the village of Pum Noi, we watched Kachin women weaving their Tartan cloth. From this point the path dropped in some places very steeply to the Khara Hka, a stream at 2,800 ft. Rising abruptly the path led up to Tasu Bum (4,200 ft.), the highest point of our march (14 miles from the last camp). On our arrival we quenched our thirst with cups of cocoa made with Nestle's milk chocolate and water boiled in bamboos. The Kachins here cultivate a small patch of tea, as also oranges, peaches and plums. Blister flies were bad. Villagers brought in a number of peacock-pheasants and a squirrel (*Dremomys*).

On January 31st the party secured specimens of langurs, squirrels (*Callosciurus*) and gibbons, while a cobra and two green whip snakes were brought in by the villagers, as also several birds and small mammals. Here the minimum temperature recorded during the night was 51° and the maximum temperature during the day 84°. On February 1st we struck camp and marched to the river Tapa Hka. Three langurs and a gibbon were collected; once a bison crashed across the path ahead of us. Pitching camp at Tapa Hka (800 ft.) the surrounding area was explored and a few specimens collected. Tracks of tiger were seen and numerous old tracks of elephant. Leeches were much worse here. 'Gooming' at night with jacklights yielded nothing, but Raven secured a Scop's owlet. Baits put out for tiger yielded no result. Gibbons, squirrels and a pheasant were secured by the party on the following day.

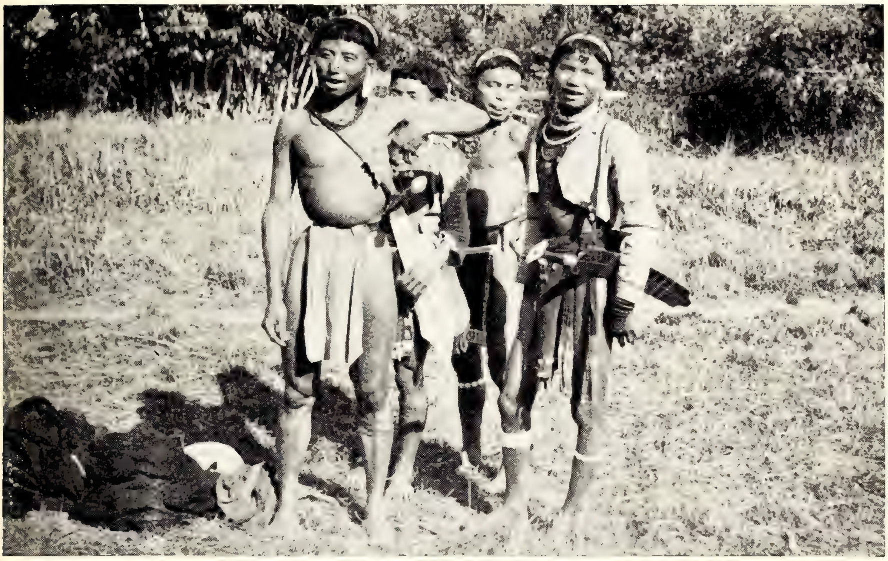
Four of the mules and one of the goats became very ill here through eating something poisonous, two of the former dying.

Species of *Dipterocarpus* and *Pterospermum* were frequent, growing to a tremendous size. Aroids were numerous, bird life fairly rich, but animal life definitely poor. The temperature recorded was minimum 54° and maximum 78°. Specimens collected on February 2nd were a male gibbon, a *Callosciurus*, a peacock pheasant and some birds. On February 3rd we moved to the Tumri Hka, a distance of about 20 miles, and camp was pitched on a sandbank. The mules kept up marvellously well in spite of the fact that some of the going was difficult: had they been less sure-footed, casualties would have occurred along places where the ground dropped steeply from the path. In one stream we found a quantity of petrified wood including large logs which Raven considered were possibly of the Tertian (Miocene) period, about twenty million years old. Three species of a beautiful wild Begonia were seen and gathered by McCann. The jungles were full of two or three kinds of stately palms. White sap oozing from stumps of saplings and trees, cut by the men clearing the path ahead of us, gave the stumps the appearance of having been whitewashed. A sambhur hind and a muntjac were seen crossing the Tumri Hka in the evening. The young gibbon captured at Pumsin was by now quite tame and flourishing.

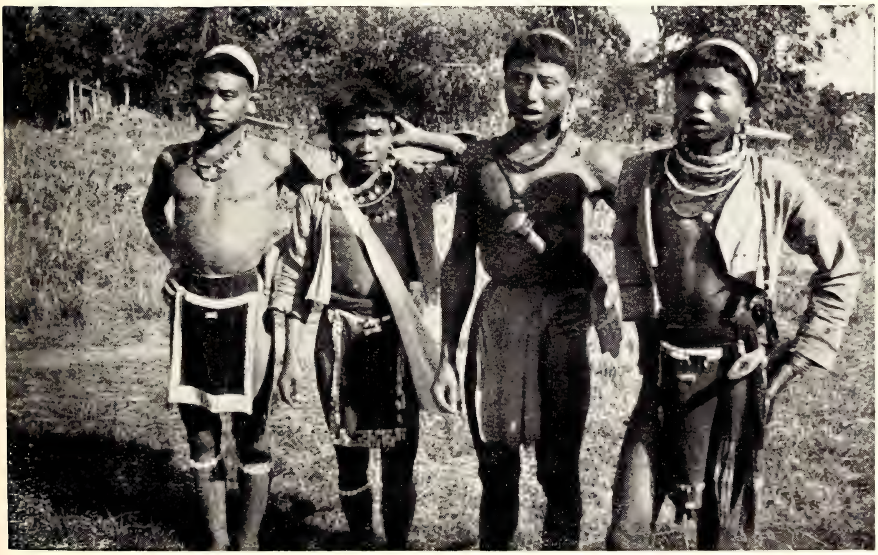
On February 4th leaving Tumri Hka at 8 a.m. we waded down the river (650 ft. above sea level) for one and a half hours. Four otters were seen, but we were not successful in collecting a specimen. Quite a number of tracks of elephant, bison, sambhur and tiger were in evidence though few were fresh. From here onwards the greater hornbill was common. Down the stream, we frequently came on places where gold washers had been at work. Crossing the Taro Hka the path led through tall elephant grass and on through dense evergreen and bamboo forest finally entering *taungya* and cultivation. Along the path were tracks of tiger, some quite fresh. A mile from Dalu (Taro) we passed Kolun, a Chin village. Dalu, a Shan and Kachin village on the banks of the Chindwin or the Tanai Hka, as it is known here, was reached at noon. On the way one of our goats was drowned in the river, how this actually occurred we were never able to discover. Some of the outfit, including two boxes of cartridges, some cases of skins and one containing kit, got soaked in crossing the rivers. Baits were tied out in the evening and those of the party who were keen fishermen went afishing, the two fish caught being served up for dinner. Two of the party occupied the local Rest House at Dalu, while the remainder were in tents. We had marched about 130 miles from Nanyaseik. On the following morning, Major Rowley and the writer, crossing the Chindwin in a dugout, set out for a Kachin village, Taga Hku, at the foot of the Naga Hills, west of the Chindwin river. The river flowed for eight miles mainly through fields of poppies (cultivated for opium). Wild strawberries, insipid to the taste, grew in profusion. A heron and two or three other river birds were collected, and Taga Hku was reached at about noon. With the aid of our interpreter the possibilities of a visit to a salt spring some distance away in the jungles were discussed with the villagers. Here we saw our first Nagas or Wangas as they called themselves. Our interpreter informed us that Nagas were actually sections of the Chin tribe.

Returning we travelled down the Taga Hka on bamboo rafts, shooting rapids, collecting birds, and taking movies, reaching Dalu in the evening. When nearing the western bank of the Chindwin, the leading Kachin drew the writer's attention to what apparently was a fine jungle cock. Fortunately the writer's aim was not good, a torrent of language from a neighbouring hut proclaimed that the owner wanted to know why we were firing at his poultry! On the following morning Rowley and Hopwood went fishing down stream, while preparations were made for an expedition to the salt springs in the jungles at the foot of the Naga Hills. Specimens of squirrels (*Tomeutes* and *Callosciurus*) were secured in the jungle nearby and thirty frogs along the river's edge. On February 7th, McCann and the writer, accompanied by our interpreter, a servant, and seventeen men, left for the salt spring at Lahkaw Hka following our previous route to Taga Hku. From Taga Hku village to Lahkaw Hka, where a camp had been prepared for us in the depth of a vast area of evergreen forest, we had to wade knee deep, two or three miles up the Tara Hka. Following an elephant-path we eventually reached our camp. The huts were of palm-leaves and one joint bed, raised a little off the ground, was covered with a mattress of the same material. Leeches were in abundance and the path to the salt springs, about a mile away, led through an evil-smelling bog. At the salt springs, tracks of elephant and bison, all old, a few fresh tracks of sambhur and those of a large tiger were seen. The tiger was obviously a regular visitor. The salt-lick and its surroundings were truly beautiful—banks of grey or of grey-blue overlaid with brown sandstone. That evening the Kachins brought in a Banded Krait. On the following morning another visit was made to the salt-lick. The tiger had again visited the salt-lick during the night and some of its droppings were found to be chiefly composed of salt-lick earth. There was nothing salt in the taste of the earth of this lick and, as in the case of most so-called salt-licks in India and Burma, it was hard to determine the reason for its popularity. The Lahkaw Hka salt springs are in two parts. One of the banks at the upper lick had been worn into a curve by elephants continually rubbing against it. Kachins were deputed to erect two machans over the licks, on the chance of seeing the tiger during the night. But our hopes were however not fulfilled, we had a wet night's vigil without the reward of seeing a single animal. At the lower and smaller lick elephants had holed the banks with their tusks in several places. The Kachins informed us that we were the first Europeans to visit the salt-lick and, in fact, that part of the country. On the 9th February the salt-lick was re-visited, photos and samples of the earth being taken. During the day we collected some birds and a type of *Callosciurus* quite new to us and possibly a new form. Kachins brought in a number of birds including pheasants, partridges, and a squirrel (*Dremomys*), also a small pit viper. Snares laid for pheasants in the jungle around produced victims daily. It is obvious that the Kachins live well of the jungle and in view of the large number of snares set for birds, porcupines, etc. in the vicinity of Kachin villages it is amazing that such a large number continue to exist. Snares for pheasants were invariably of the bent-over stick type with a noose held down on a small circular patch of cleared ground, the bait being small red berries which appeared to attract the bird. On February 10th we struck camp and returned to Taga Hku collecting *en route*. Leeches were very bad after the previous night's rain. A number of birds were collected, among them a serpent eagle. We found the Tara Hka deeper afer three days' rains. When near Taga Hku, McCann and the writer were both stung by the giant stinging nettle (*Laportea crenulata*) which is common on the banks of the rivers and streams in those parts. Contact with water increased the pain from the stings considerably and their effects were felt for three days. At Taga Tku we pitched camp. A 'goom' after dark produced no results although a muntjac and a small animal, probably a civet, were seen. On February 11th two Pied-Hornbills were secured on a *Ficus* tree nearby before leaving for Dalu, also a diminutive squirrel (*Tamiops*), two monkeys (*M. rhesus*) and another specimen of *Callosciurus* similar to that obtained at Lahkaw Hka. Boarding dugouts, we were paddled by the Kachins down the Taga Hka, shooting several rapids. On the way down several birds including another Serpent Eagle were collected. Dalu was reached at about 5 p.m., after taking photos of a few semi-wild buffalo. Hopwood and Rowley had in the meantime returned from their fishing trip, the latter having caught several fish, but no Mahseer. One of the baits had been killed by a tiger, but Raven had no luck sitting up. On February 12th Vernay, Hopwood, Rowley and the writer left in five dugouts for the Partip Gorge, about 30 miles up-river. Arriving at the lower part of the gorge in the afternoon, we camped on the rocks bordering the river. The river here was narrow and obviously very deep, while the evergreen forest descended steeply to nearly the water's edge on both sides. Large splashes all through the night indicated the presence of turtles. A langur was collected on the journey up. On February 13th an early start was made upstream; three or four birds including a grey heron were collected on the way. Above the Partip Gorge we found gold diggers at work and landed for a few minutes to watch them. Lunching on a sandbank, we continued our journey finally tying up at 3-30 p.m. on a large sandbank. Vernay and Rowley fished for the pot while the writer collected birds in the adjacent forest. It was noticeable that the slots of sambhur in these jungles were very large, possibly due to the swampy nature of the jungles in wet weather. Similarly the semi-wild buffalo leave tracks almost as large as quarter-plates. On the following morning, while breakfasting at 5 a.m. peculiarly raucous calls were heard from the other side of the river and a pair of eyes was reflected in the light of a jacklight flashed across. Rowley quickly slipped across the river with his rifle and shot one of a pair of large Fishing Cats, a fine specimen and a welcome addition to the collection. Returning to Dalu, our progress down-river for the first hour was very slow on account of dense mist. The Partip Gorge is indeed beautiful with its steep forest-clad sides and low banks of rock, either bare or fern- and moss-covered, while the water appeared to be as still as in a pond. Although the journey up had taken nearly two full days we reached Dalu in one, which involved hard work for the boatmen. On the way down, two hawks were seen attacking a great eastern purple heron, which, probably would have been killed had the hawks not been disturbed by our presence. Vernay also saw a hawk kill a common egret and was able to recover the latter. At Hopwood's suggestion the five boats took part in a race with only the boatmen paddling. We had noticed that Hopwood's boatmen had been paddling in a most regular and disciplined manner for sometime prior to this, and it transpired that he had been preparing them for the race, needless to say his boat won! Dalu was reached at 7 p.m. the journey having taken just 12 hours. On landing the writer sent off four rocket (firework) cartridges much to the boatmen's delight. Raven had had no luck with the tiger for which he had sat up three nights, although the animal was heard giving tongue far and near. In our absence, McCann had added mammals and birds to the collection, and while engaged in the good work met with a demonstration from a tiger late in the evening in dense undergrowth. He sat up for this tiger (over a goat) with no better success. The minimum temperatures recorded at Dalu during the nights ranged from 54° to 58° and 76° to 80° during the day. On February 15th, four Wanga Nagas came in and were subjected to photography for some time. Their village was apparently away in the interior of the Naga Hills, at an elevation of about 8,000 ft. They were small men compared to the Nagas we saw later on, but even so they were fine specimens of humanity and bore themselves well. Endeavours to persuade these men to take us to their village met with no success: they were adamant in their refusal on the grounds that it would be too dangerous. On February 16th Hopwood left us to return to Rangoon taking with him cases of prepared specimens and 58 of our mules for which we no longer had loads. The writer then developed fever and had to lie up. McCann, while sitting under a *Ficus* in fruit, made an excellent collection of gibbons (capturing a young one as well), flying lizards and squirrels. In the evening Raven and Vernay took flashlight photos of the interior of the Kachin houses.

While at Dalu, a member of the party received a letter addressed to him 'C/o Veterinary-Hospital Expedition' (for Vernay-Hopwood Expedition)! The 17th found the writer still in bed with fever. McCann added to his previous day's collection under the fig tree, and in the adjoining jungle secured four more gibbons, another specimen of the flying lizard, and some birds. Unfortunately the young gibbon caught alive on the previous day strangled itself to death in McCann's tent. By February 18th the writer's fever had eased off and camp was struck. A short journey was made down river to Lakchang Ga, a Kachin village, on the western bank. The mules swam across the river while our outfit was taken across in two twin boats formed of two dugouts lashed together with a curved mat roof over the centre. Both Lakchang Ga and Dalu are surrounded by paddy fields bordered by dense



Wanga Nagas at Dalu.



Wanga Nagas at Dalu. Note the buffalo rib worn in the hair.

evergreen forest. Around these villages a species of lemon, originally cultivated, now grows in wild profusion, especially in abandoned *taungya*. The fruit is quite uneatable. The Kachins displayed the keenest interest in us and in our work. At Dallu we were favoured with the visit of a Chin man and two women who had come on a three days' journey to catch their first glimpse of white men. They brought eggs and a piece of handwoven cloth and in return received half a bag of salt, which to them was worth far more than it sounds. The headman of Lakchang Ga was a man of some substance and importance, owning a large tract of country, mostly heavy forest including however several Kachin and Chin villages. In times past the Chief of Lakchang Ga owned a number of slaves, who were bought their freedom by Government, the Chief receiving some thousands of rupees in cash and, as the slaves continued to work for him contentedly though free he did not lose much! At the request of the Kansi Duwar, the Chief of Lakchang Ga had continued the good work of clearing a path for the expedition on the western side of the Chindwin. Between these two Chiefs about 85 miles of path had been cleared for the expedition through dense jungle, no mean work, and without which, the expedition's progress would have been fraught with greater difficulties. Leaving Lakchang Ga on February 19th we journeyed down-river for about 8 miles pitching camp at Rasa, a Chin village on the west bank. The Chin villages are noticeably not as clean or as orderly as those of the Kachins. In the evening a species of langur not yet obtained (*Pithecus pileatus*) was secured. On the following morning, camp was struck and the expedition now divided, Vernay and Rowley continuing down-river in the boats, while Raven, McCann and the writer carried on west of the Chindwin with the mules. The path from Rasa followed the bank of the Chindwin for a mile or two and then cut through heavy evergreen jungle. At one or two places on the bank small patches of surface coal were noticed. Pausing for refreshments at the deserted village of Jantang (750 ft.), we finally arrived at the place selected for our camp on the Tagum Hka shortly after 3 p.m. (elevation about 750 ft.). The path from Jantang had taken us up to 1,150 ft., and we crossed the Mergui Hka two or three miles further before reaching our camping site. Here three langur (*Pithecus pileatus*), including a young one, and a female gibbon and her young were secured. At Jantang we collected several specimens of sunbirds. Heavy rain fell during the night. For dinner we ate langur but thought it a bit tough. We found that our otherwise excellent 1 in. = 1 mile maps were a bit out for this region, the Tagum Hka not being marked in at all. The writer was nearly sucked dry by the father and mother of all leeches, of a colossal size, and this monster was quickly consigned to the fire. One of the party's 12-bore guns had ceased to function, but temporary repairs to the broken lock-spring were cleverly effected by Raven, quite the most handy man of the party, even to the extent of resoling boots. February 21st saw us add two gibbons, two grey-tailed *Callosciurus* and two macaques which were new to the collection.

These macaques were closely allied to *Macacus rhesus*, but larger and more heavily built. It is now almost certain that they were the long-tailed *rhesus* of Burma, specimens of which are badly required by the British Museum. The forests in these parts include many species of *Ficus* and *Dipterocarpus*. On the following day a large langur and two grey langurs collected on the east bank of the Chindwin, were brought in by Vernay who visited the camp from his boats away down on the Chindwin river. Temperatures recorded at Tagum Hka were 54° to 57° minimum and 66° to 71° maximum. On February 23rd we struck camp and while marching came on a troop of gibbons of which Raven took movies, and subsequently a male and a female were secured. I should have mentioned that the variations in colour in these Hoolock gibbons from adolescence to maturity is most interesting. In infancy the colour of both sexes is silvery, gradually darkening, until within a year both sexes are black. On reaching the adult state however the female becomes fawn-coloured, the male remaining black.

One of the most interesting features of the collection was the natural bar afforded by the Chindwin river. In the case of nearly all species of mammals we found, the male adult gibbons, east of the Chindwin have a patch of white hair in the region of the scrotum, apart from the white bands across the forehead, the bridge of the nose and under the chin. West of the Chindwin river the adult male has the white band across the forehead, but the white hair round the scrotum is completely absent. By far the most interesting differences however were displayed in the range of squirrels (*Callosciurus*), collected on both sides of the Chindwin.[1] Whereas from Nanyaseik to Dalu the colour of the animal remained fairly constant, it was found that on crossing the Chindwin river, west of Dalu, the *Callosciurus* with their almost white tails presented quite a different appearance. This type remained fairly constant all through our journey on the western side, the only variation occurring in the amount of white to be seen on the tail. For instance, on the 23rd February, two specimens were secured with tails slightly darker than those collected on the western side previously.

Our next camp was located at Changa Hka about 12 miles from Tagum Hka. The path from Tagum Hka to Changa Hka at first rose rapidly to 1,200 ft. finally dropping steeply to our camp site at 1,700 ft. Two gibbons and some specimens of *Callosciurus* were added to the collection. On February 24th sixteen mammals were collected, including four gibbons, ten *Callosciurus*, one *Dremomys* and a young macaque. As a collecting area this seemed a promising one, but unfortunately we had to move on as difficulties arose in regard to fodder for the mules. *Callosciurus* especially were very plentiful and there were evidences of a number of muntjac. The minimum night temperature 54° and the maximum day temperature 64°. A dinner of squirrels proved good eating. We left Changa Hka next morning the path rising at the start very steeply and gradually ascending till a height of 2,900 ft. was reached, whence we descended to 2,110 ft., the elevation of our next camp at Hai Bum. This is quite a large Chin village, not however shown on the maps, and about 15 miles from our last camp. On the way specimens of *Ratufa*, five gibbons and a langur were collected, and one or two birds, and unfortunately we wounded and lost two or three langurs. While chasing these langurs McCann had rather an unpleasant fall leaving him rather shaken. On our arrival at Hai Bum the headmen of seven villages paid a call and brought Naga spears, dahs, chickens, eggs and plantains, all of which were duly paid for! We were now in the Chin country; and the Chins brought us pheasants (both silver and peacock), a number of birds, and three brush-tailed porcupines. After tea a ceremonial visit was paid to the house of the Headman of Hai Bum and we all, with the aid of our interpreter, conversed round a fire in his house, sitting on little rattan stools. He shortly produced a certificate given him by the Assistant Superintendent, Frontier Service, a few years before, in which it was indicated that the Headman had promised to hold no more human sacrifices and to keep no more slaves. Our query as to whether he had kept his promises was received with considerable mirth! When human sacrifices were prevalent the person selected, usually a slave, had a really wonderful time for quite a lengthy period before he was sacrificed. Fed on the fat of the land and country beer (to fatten him up) and doped with opiates, the victim probably did not worry at all on the score that he was soon to shake of this mortal coil.

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[1] A coloured plate with descriptions of seven different colour forms of one species of squirrel (*C. sladeni*) collected along the Chindwin River between Hkamti and Yin by the Society's Mammal Survey will be found in the Society's *Journal* (vol. xxiv, p. 224)—Eds.

The Kachins, Chins and Nagas are all spirit ('Nat') worshippers, and the symbols of their worship are to be seen in the large number of funnel-topped 'Nat' poles outside their villages and their sacrificial houses. Semi-wild buffaloes are retained entirely for sacrificial purposes and in no case is any milk of cattle or buffaloes drunk by them; in fact they consider milk to be in the nature of excreta. Raven, who had had years of experience collecting in the Dutch East Indies was extremely interested in these tribes and found that in features, dress, many of their customs, in the black fibre 'garters' worn below the knee, and in other respects they corresponded closely with the Dyaks of Borneo and the Taragas of the Celebes, many words also being common to or similar in their languages. In our subsequent expedition to the Malayan jungles, Raven and the writer found certain similar features in the case of the Sakais of Malaya, and his view was that at one time an Indo-Malayan migration southwards from the north of Assam and Burma must have taken place.

On February 26th, specimens of *Callosciurus*, a *Tomeutes*, a langur and a gibbon were collected and a variety of birds, fifty of which, including a peacock pheasant and a partridge, were brought in by the Chins. The Chins are adept at shooting birds and squirrels, and clever at spearing them with sharpened bamboo splinters stuck into bamboo poles. Raven was pleased at being able to secure for the anthropological side of the collection a piece of bark cloth made from the bark of the Upas tree (*Antiaris toxicaria* Lesch.), from which also a deadly poison is collected by these tribes for the tips of their darts and spears. Here it is interesting again to record that the same tree is utilised for the manufacture of bark cloth and the extraction of poison by the Dyaks and Taragas of the Dutch East Indies. On the following morning we left camp early and the day's collection comprised a greater hornbill, a number of *Callosciurus*, four *Tamiops*, a *Ratufa* and a number of birds including an oriole and an owlet. This being the Chin New Year's day the Headman brought us two goats, a fowl and eggs, expecting of course the usual return in cash which was duly paid, and invited us to a Chin dance in the evening. At their request six firework cartridges were fired by the writer, while Raven took flashlight photographs of the scene which was most picturesque: dancing in a complete circle, men and women with arms interlocked, the men sang the first phrase of each song and this was taken up by the women and boys. The Headman's son in particular presented a fine appearance in his tribal dress, akin to that worn by the Nagas. On February 28th we were just about to leave camp when Vernay and Rowley turned up having climbed about 1,600 to 1,700 ft. up the steep path from the Chindwin river. They brought with them a specimen of Slow Loris (*Nycticebus*) and another specimen of the Long-tailed Rhesus. They had had good fishing, especially at the Kyaukse rapids where unfortunately Vernay lost a mighty mahseer; they were the first white men to fish there. The total collected for the day amounted to three gibbons, a number of squirrels, and birds including a peacock-pheasant secured while displaying. A 'goom' in the jungles at night produced no result. For night work these jungles are like a grave-yard, and do not compare with the evergreen jungles of South India in the amount of life held. Temperatures recorded varied from minimum 56° to 63° to maximum 82° to 92°. An interesting feature of Hai Bum is its boat-building industry. Although situated 1,600 or 1,700 ft. above the Chindwin river fine big dugouts were carved out of the trees of the forest adjoining Hai Bum and dragged down to the river far below.

On March 1st, several *Callosciurus*, a *Tomeutes*, three gibbons and a number of birds were collected while the Chins brought in birds, pheasants, a snake and two *Tomeutes*: the last shot with cross bows.

Neither the Chins nor the Kachins seemed to be able to grasp the idea of driving animals towards guns. If sent in to the jungle they would invariably go straight towards the object to be driven instead of encircling it, thus driving it in the opposite direction. Another point they have in common is their habit of cutting leaves to sit on when sitting on the ground.

We had now collected over 100 mammals since leaving Lakchang Ga alone. The next day ten more mammals were added to the collection including three giant squirrels, two gibbons, a langur and four specimens of *Callosciurus*, also a number of birds and a terra-cotta-coloured snake, probably a species of *Zamenis*. The collections of mammals were made at elevations between 700 ft. (near the Chindwin river) and 1,700 ft. Temperatures during the last two days and nights recorded were 56° minimum and 84° and 87° maximum. The locals brought in 27 bats consisting of *Hipposiderus armiger*, *Rhinolophus* and a *Pipistrellus*. The three goats presented us previously by the Chins were today slaughtered for the Museum, and the meat utilised for the pot and very good it was too, not a trace of goaty flavour. The Chins, in these parts, like the Kachins, are not good tree climbers and prefer felling a tree of any size to climbing it. We found the Chins less talkative than the Kachin fraternity and possessed with a somewhat less degree of humour. Large species of *Dipterocarpus* were plentiful in the forests round Hai Bum and from these the dugouts were hewn. Fine specimens of a species of *Pterospermum* and of *Elaeocarpus* also abounded, the nuts of the last two being eaten by *Ratufa* and *Callosciurus*. Many and large also were the Upas trees (*Antiaris toxicaria*) from which the Chins, as already stated, made bark cloth and derived poison for darts and spear heads. McCann drew the writer's attention to the fact that little puffs of 'smoke' seemed to appear as the 'fruit' fell from these trees which for a time puzzled us, but we eventually discovered that they were actually puffs of pollen dust and probably Nature's means for the dispersal of the pollen. The fruit lay in abundance on the ground, but neither mammal nor bird were seen to feed on it.

On March 3rd camp was struck and we left for Sailung on the Chindwin river passing through the village of Lachu Ga *en route*. Our path from Hai Bum to Sailung took us up to 2,500 ft. and then dropped rapidly down the valley to the Chindwin. The views obtained of the surrounding country and of the Chindwin valley were superb. A specimen of *Callosciurus* and some birds were collected. Sailung was reached at noon and here a message from Mr. Vernay was handed to the writer intimating that the mules were to be paid off and the journey down river to Singkaling Hkamti made in twin dugouts connected by a bamboo platform, in pontoon formation. Their accounts settled, the muleteers swam the mules across the Chindwin. The men first pushed out into the river on a raft and when some distance off the shore called to the mules which at once entered the water and commenced swimming—a most interesting spectacle. Pitching camp on a large sandbank at the river's edge, McCann and the writer paddled up-river in a dugout that evening in the hopes of obtaining further specimens of the long-tailed *rhesus*. On the way a peacock was unsuccessfully stalked. It was fairly dark as we came up to a troop of macaques on a tree overhanging the river. Landing on the rocks at the water's edge we climbed the banks which were almost sheer. While attempting to locate the macaques, McCann slipped and just saved himself from a nasty fall though his gun sustained a little damage. He was certainly the champion faller of the party! At dusk while using our jack-lights, McCann stalked and fired at the glowing embers of a fire left by fishermen on a sandspit taking them for the eyes of an animal! Curried turtle eggs were served for dinner that night and proved quite tasty. On the following morning we left Sailung at 8 a.m. in three twin boats with the double flies of tents rigged up over each boat. Movies were taken of men locating and digging out turtle eggs on a sandbank, and an otter was shot, but unfortunately sank and was carried away by the current before it could be recovered. Two otters were seen and were found to be eating a young turtle. Singkaling Hkamti was reached at 6 p.m., Vernay and Rowley meeting us at the riverside and introducing us to the Sawbwa of that State. The Sawbwa proved quite a useful collector and added a number of specimens to our already valuable collection. Specimens of *Callosciurus* collected here showed a distinct change in colouration being very much lighter than those collected on the eastern side up-river. Next morning Rowley and the writer accompanied the Sawbwa on a round through the jungle nearby. Three specimens of *Callosciurus* were obtained and a number of birds. Two tanks holding duck, geese, snipe and other water fowl were visited but we were only able to secure a single snipe, shot by the Sawbwa. The Sawbwa used Vernay's ·22 rifle on doves with considerable accuracy. In the evening a further specimen of *Callosciurus* and an owl were secured and later, a group of Nagas came into camp and gave us an exhibition of their war-dancing and singing which was quite impressive. Most of the Nagas had splendid deep voices and their chanting was most harmonious. The whole was supposed to represent a party out head hunting and the dance on their return with their spoils. On March 6th Vernay, Rowley, Raven and the writer, together with the Sawbwa, left for the village of Hahti, away in the Naga Hills. This village had been concerned recently in a successful head hunting expedition. Crossing the river in boats we walked for about 18 miles reaching an elevation of 2,200 ft. It was a very hot day and the switch-back nature of the route made it all the more tiring. Our loads were carried by Nagas who rested for a little at the Naga village of Kawai (half way) while we had our lunch. The writer secured a couple of gibbons and a *Tamiops*, while the Sawbwa shot a *Callosciurus* and a partridge. On approaching Hahti, which we reached at 5 p.m., one of the headmen advanced out of the village to meet us and, satisfying himself that the party had not come with any hostile intent, he led the way back to the village, and we were accommodated in huts that had been prepared for a military expedition expected soon to deal with an head-hunting affair. It was noticeable that the Naga villages were generally situated on bare hill tops or ridges with the jungle cleared away all round, presumably to safeguard themselves as much as possible from surprise attacks. That such attacks could nevertheless be carried out successfully was shown by the fact that the Nagas of Hahti and five other villages attacked at dawn the large Naga village of Wantung about 30 miles away. First completely surrounding the village, the attackers on three sides yelled and, as some of the inhabitants, in panic, attempted to escape in what appeared to be a safe direction, fifteen were cut down and decapitated. Satisfied with their spoils,

Rasa Nagas at Hahti.

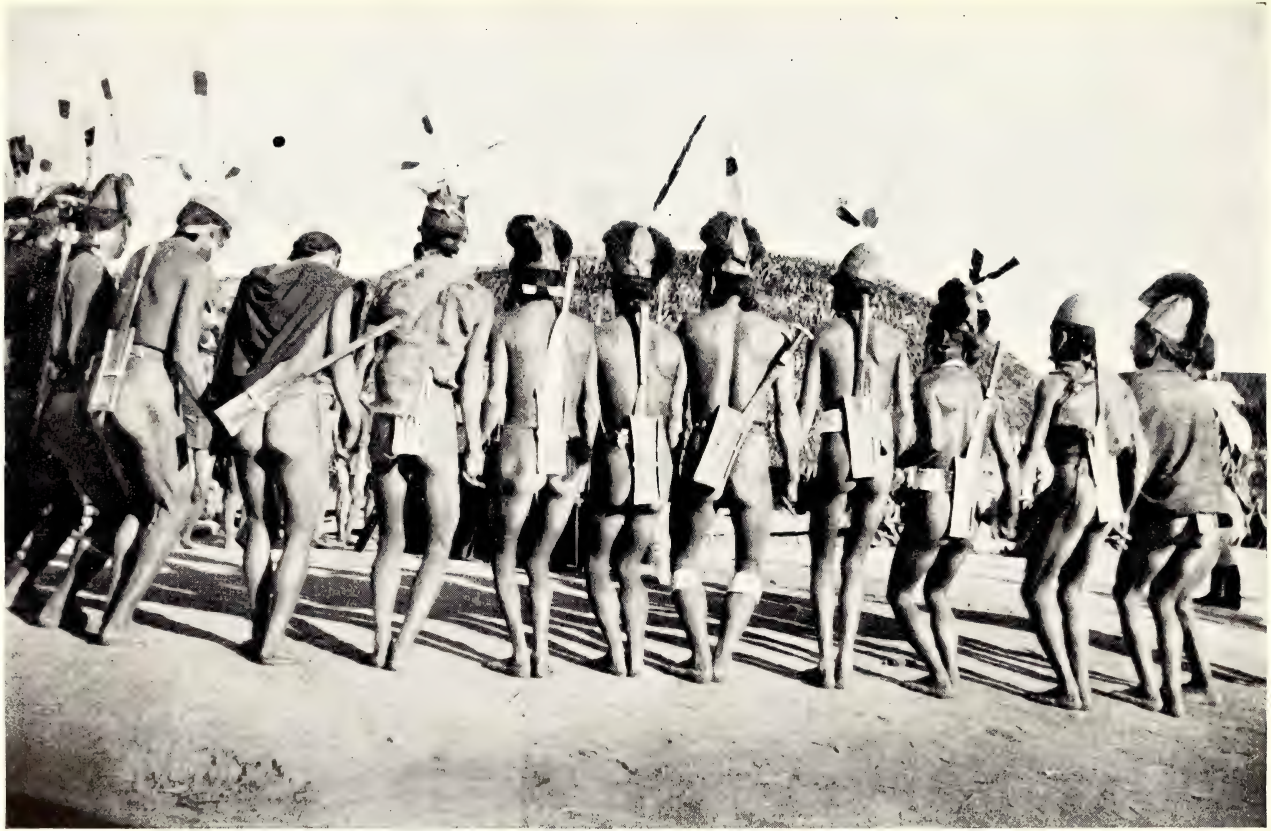
Camp at Singkaling Hkamti.

the attackers returned and divided the heads equally amongst the six villages, each village being allotted two and a half heads! A report on the affair was transmitted to Government by the Singkaling Hkamti Sawbwa, and the village was heavily fined as being the instigators of the raid. We were informed that the Wantung villagers would certainly retaliate in due course, though possibly not for some years. It should be mentioned that the Sawbwa had been induced to take us to Hahti with a promise of Vernay's 20-bore shot gun and 200 cartridges! We were shown a hut where the Nagas placed their dead, the corpse or corpses being kept on a raised platform inside. Eventually the huts collapse together with the remains of the dead and a ceremony is then performed over the skull which is subsequently put back with the remains. At times we were unpleasantly reminded of the proximity of these burial huts when the wind happened to be blowing in our direction.

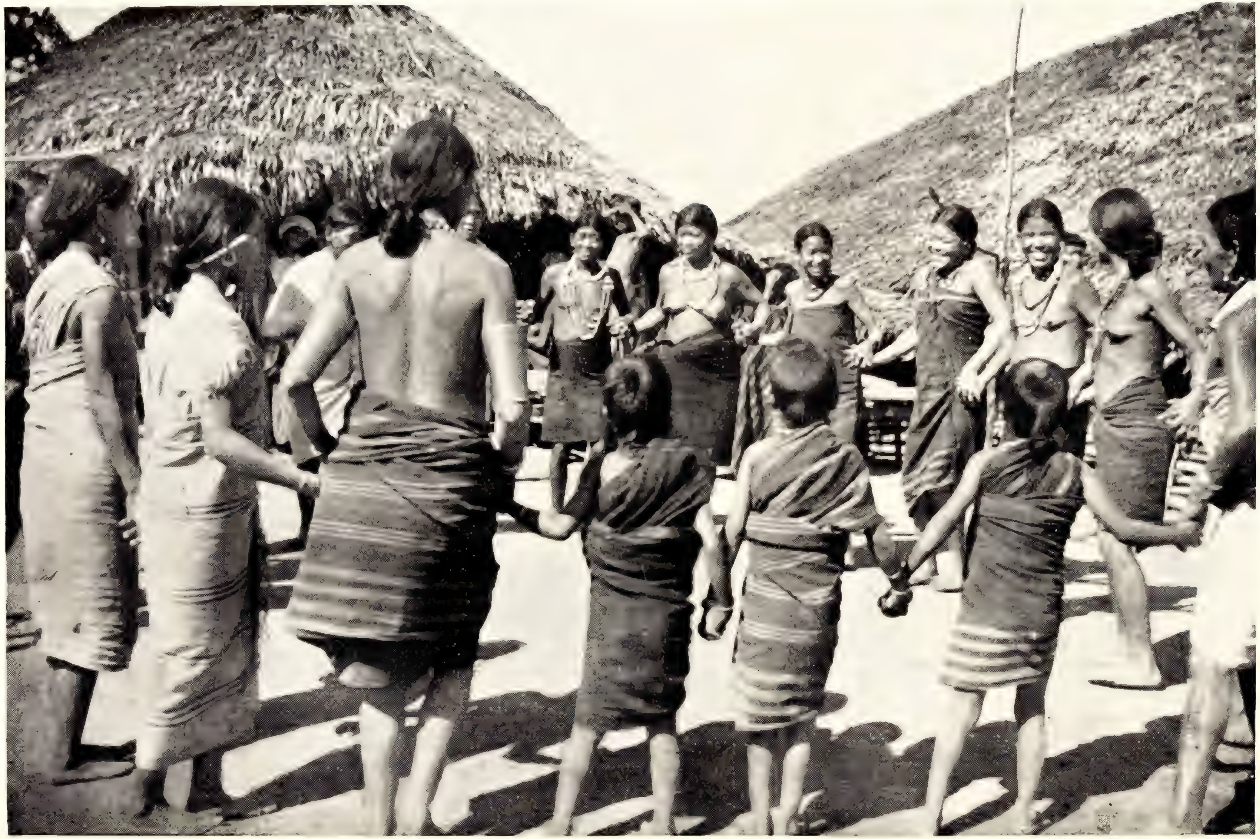
Magnificent specimens of manhood these wild Nagas! Their dahs (long-handled choppers), stuck in short wooden sheaths slung on their backs hang nearly vertical up the centre of the back and are drawn out over the shoulder—a contrast to those of the Kachins and Chins, who carry their dahs slung to one side. The blades of their dahs are narrower and considerably lighter; and in most cases the slings are adorned with a portion of a tiger's or panther's jaw. The Naga men were nude except for a short black cloth hanging from the waist in front, and the women wore a short black skirt of coarsely-woven material. The men always carry spears, the blades of which are sometimes protected by a bamboo sheath. Both men and women are tattooed on the face and body.

On the following morning the writer collected a specimen of *Callosciurus* (both this specimen and that secured on the day before had very much darker feet) while the Sawbwa secured a *Tomeutes* and three or four birds. Photos, both still and movies, were taken in the village of the 'Nat' poles, the war drum, and the skulls of the victims of the recent raid. A portion of one of their victims' hands was nailed up on a tree-trunk at one of the entrances to the village while the remains of a tiger-skin were stretched over a wicker frame above the human skulls. The Nagas here appeared to have a special breed of goats with black heads and white bodies. One of these was purchased for the Museum, the meat being given to the Nagas. The expedition also paid for two pigs which were slaughtered by the Nagas for the feast. Tied up in the village was a fine specimen of a bull Mithun. The remainder of the herd were apparently in the jungle and were said to return to the village at nightfall. As in the case of the semi-wild buffaloes to be found in the vicinity of Kachin and Chin villages, these animals are only used for sacrificial purposes. The buffaloes were rarely aggressive and would generally crash away into the jungle on our approach. In the afternoon the Naga women gave us an exhibition dance while the men put on their full war regalia and reacted the outgoing and return of a Naga head-hunting expedition. First the Naga warriors were called together by the beating of the war drum (a hollowed-out tree trunk). This was done in a most rhythmical way with poles, and the party then left the village. Returning with their spoils the party danced into the village headed by two warriors dancing backwards at the head of the column. As they reached the centre of the village the column formed into a ring and with dahs drawn the dancing and chanting continued for some time, a most impressive scene. Some of the warriors carried oblong-shaped shields of either stout leather or beaten-out kerosene tin. The men's war helmets, or wicker caps were topped with a ring of bear's fur and adorned with hornbill feathers, while in front, in some cases is sewn a pair of very fine boar's tushes. The Headmen's helmets were generally crowned with a thick fringe of goat's hair dyed red. During pauses in the dancing, exhibition duels with spears and shields took place between a couple of warriors, while the ever-present funny man was really amusing with his antics—a true clown. The Assistant Headman, a magnificent specimen, when not drinking beer out of a bamboo receptacle, was continually exhorting the men to further efforts. After it was all over the men were presented through the Sawbwa, with beads and the women with skeins of yarn and needles, all of which were much appreciated. At night the village presented a most animated appearance, large fires burning in the centre of the village, and sounds of mirth emanated from the houses around. Built upon stilts, as are the Kachin and Chin houses, the Naga huts were akin to those of the Chins in appearance, not being so clean or well kept as the long houses of the Kachins. After dining we returned to the village where Vernay and Raven took flashlight photos of scenes in the interior of two houses. In the first the inhabitants were sitting round a pot of boiling pork and goat's meat, in the second house, the people had just prepared themselves for the night; a young couple were on a bench to one side, a group of bachelors were lying on the floor in the centre of the house, and other inmates occupying suitable spots in the long room. Many of the Nagas kept up a Gregorian-like chant to a late hour, their musical voices blending in fine harmony. We were told that the tiger which had once borne the skin now hanging in tatters on the wicker frame had been shot by the Headman's brother with a bow and poisoned arrow. We were up early next morning and after purchasing a few things the Nagas brought for sale we bade a regretful farewell to Hahti and its Nagas, a cheerful and good lot they appeared to be.

The journey back to Singkaling Hkamti was considerably easier than the march up. A *Tomeutes* and a gibbon were collected. Some of the jungle passed through was typical Serow country and evidence of their existence was provided by the number of Serow horns worn by the Nagas on their dah sheaths, the Serow being hunted by the Nagas with their dogs. On reaching the Chindwin river, Vernay, Raven and the writer stripped and had an enjoyable bathe in the cool water. McCann had not been idle in our absence having collected about two dozen specimens of *Callos-*



War dance of Rasa Naga Braves at Hahti. Note the position of the *dahs*.



Dance of Rasa Naga women at Hahti.

ciurus, a *Ratufa*, *Tamiops*, two gibbons, a Loris (*Nycticebus*), and a number of birds.

I should mention that at Singkaling Hkamti, Raven discovered that Vernay had found what proved to be a valuable addition to the collection, the fossilised tooth of a Stegadon (a pre-historic elephant) anything from two to thirty million years old. Vernay had picked this up while fishing on the banks of the Chindwin river near the Kyaukse rapids. Subsequently further pre-historic fossil remains were presented to the collection by Mr. Bodekar, District Forest Officer at Mawlaik, earning the gratitude of the expedition and the Museum.

As a reward for arranging our visit to Hahti the Sawbwa of Singkaling Hkamti was duly presented with Vernay's 20-bore shot gun and cartridges.

The 9th March was taken up in a re-sorting of cases of stores, camp equipment, calls on the Sawbwa and a further visit to the jungle around. During dinner one of our servants nearly trod on a Banded Krait which McCann adoritly caught. Later two of the party 'goomed' up river in a dugout but had no luck. A 3- or 4-lb. fish however, possibly dazzled by the lights, leapt right over the boat hitting the front boatman in the back!

Singkaling Hkamti is the capital of the Shan State of that name. We were able to obtain here a few provisions such as condensed milk, cigarettes, sugar, potatoes, etc. An extensive area of paddy cultivation extended to the east and south of the village. Beyond this lay a mixed forest of evergreen and deciduous trees, chief among the latter being *Ficus glomerata*, *Woodfordia fruticosa*, *Elaeocarpus* sp., *Bombax* and *Phyllanthus Emblica*. A certain amount of tea is cultivated on both banks of the river and the writer noticed a few coffee trees (*arabica*) growing in the compounds of the houses.

While we were striking camp on the 10th the villagers brought in a civet cat and two turtles. Loading all our equipment on twin dugouts we travelled downstream till nearly dusk, dining and sleeping on the sands at Heinsun. The Sawbwa accompanied the expedition downstream as far as the limit of his territory. Early next morning the party divided to collect on both banks, the total collection for the morning resulting in a *Ratufa*, nine *Calloseiurus* and two macaques. Quite a large area of tea is cultivated here, typical of Shan villages in tea country. Leaving Heinsun at noon we tied up again at Linhpa in the evening. A 'goom' after dinner produced a civet (*Paradoxurus*). On the 12th collecting proceeded on both banks of the river. Continuing our journey at noon Kunghein was reached late in the afternoon, camp being pitched on the west bank at the confluence of the Nanswa and Chindwin rivers. 'Gooming' after dinner (at which an excellent squirrel curry was served) an owl was added to the collection. Vernay and Rowley set out on a fishing expedition up the Nanswa river next morning, while the remainder of the party collected on both banks of the Chindwin. The Sawbwa went out collecting daily and produced quite a number of specimens. That night a peacock was collected by Raven while 'gooming'! On the 14th

Vernay and Rowley returned having had no success whatever. During the day 35 *Callosciurus* including four with white tails similar to those previously obtained at Taga Hku, a crab-eating mongoose (*Herpestes urva*), a *Dremomys* and a number of birds were collected on both banks of the river. 'Gooming' in the evening McCann and the writer drew a blank, but Raven returned at midnight with a civet, five turtles and some of their eggs. He had come on men who had turned a turtle over and were digging out its eggs. While watching them Raven spotted four more turtles and turning them over captured them too. Unfortunately two managed to right themselves and escaped. They had been left lying on their backs on the sand near our cots to be dealt with in the morning. Our departure from Kunghein was delayed by the work on the turtles, and in the meantime a few birds were collected. This area was quite one of the best for squirrels. The village lies on the eastern bank, and near our camp was a pagoda standing high over the confluence of the Nanswa and Chindwin. To the east of the village was the usual extensive tract of paddy lands beyond which lay the jungle, a feature of which was an abundance of large *Dillenia indica* trees, their fruit continually dropping off with loud thuds. The jungle bordering the river on the western bank here is a dense mass of bamboo and cane beyond which lies a forest of large trees composed of many species of figs and *Elaeocarpus*. Large stretches of old *taungya* covered with dense growth including *Zalacca* and *Calamus* palms made collecting difficult. A certain amount of tobacco was cultivated on both banks of the Nanswa at its junction with the Chindwin. Leaving Kunghein at noon, camp was pitched at a village named Moklok. Hearing from the villagers that elephants were raiding their crops nightly, two of the party visited the village cultivation on the 16th morning to see the damage done, but found that the elephants had not turned up during the night. Collections on both banks comprised a langur, a Rhesus macaque, three *Callosciurus*, a *Tamiops*, a *Tomeutes*, two large hornbills, and other birds. Leaving at noon we landed at Malin, where a 'pwe' was in progress, and visited the stalls and shops on the riverside. Proceeding down-river we arrived at Minsun in the afternoon and here bade farewell to the Sawbwa, Minsun being the southern limit of his State. From here we carried on till evening pitching camp on the sandbank at Awthaw for the night. Within 200 yards of camp a langur was collected, definitely different from specimens obtained up river, one of a troop in a tope of *Dillenia* trees. The weather was getting noticeably warmer every day. The specimens of *Callosciurus* collected on the east bank were still different from those on the west, while *Tomeutes* on the east bank were yellowish on the underside compared to the grey of those on the west bank. Ticks were very bad in the areas from Singkaling Hkamti southwards.

Early next morning, the 17th, the whole party visited the tope where the troop of langurs were seen on the previous evening and a further six langurs were added to the collection before breakfast. We were afloat again at noon and arrived at Tamanthi, about 14 miles down-river just after sunset. On the way down an otter was shot but unfortunately sank before it could be recovered. Our boats were moved to near the Tamanthi Rest House which we occupied. Tamanthi, with its Post and Telegraph office, fortnightly postal service and military police outpost, was our first real link with civilization again. The local doctor and the Subadar of the military police called on the leader of the expedition and the former was able to diagnose a case of illness among our servants as that of appendicitis, the first casualty among the staff. On the 18th camp provisions were checked up and supplies replenished from the local shops, while the writer and Raven made some tomato jam which we considered excellent though not apparently appreciated to the same extent by the remainder of the party! The *Callosciurus* collected here exhibited a paler form than those collected previously. Vernay went through the floor of one of the rooms in the bungalow grazing his leg rather badly. The appendicitis case was taken on board the Government Mail Launch (a stern-wheel paddle steamer) for the hospital at Homalin or Mawlaik.

Engaging two small dugouts next morning, the party travelled down both sides of the river collecting squirrels, several birds including a cormorant, a darter and a tern; also a crab-eating mongoose. Reaching Sinnaing in the evening we dined and continued the journey in the two small boats with headlamps, Rowley and the writer occupying one boat followed later by Raven and Stubbs, the skinner, in the other dugout. Both Vernay and McCann were feeling unwell and came down on the larger boat-rafts. Rowley and the writer taking two-hour shifts collected two owls and three nightjars.

At dawn on the 20th we landed at Hulaung and were joined by Raven shortly afterwards. Here more squirrels and several birds were collected including a fine fish-eagle. The *Callosciurus* from this area showed a much whiter coat than any previously secured. Raven and the writer were badly stung by the poisonous giant nettles (*Laportea crenulata*), the *taungya* on the borders of the river being full of it. After two or three days our arms and legs were still most painful. All along the eastern bank were a number of beautiful *Bauhinia* trees in flower. Camp was pitched for the night at Maungkan, the writer landing and walking along the east bank for the last few miles collecting two specimens of *Callosciurus*, a Rhesus macaque, two Imperial green pigeons and a few other birds. At dusk four bats were secured on the western bank.

On the 21st Vernay and Raven left in small boats on a fast run to Homalin, while the rest of the party followed on down-river collecting on both banks. That night camp was pitched on a sandbank in mid-river opposite the village of Kawya, quite a large place bordered on the east by an extensive area of tea. Here two *Callosciurus* were collected, the tails being quite white and their bodies nearly so. The 'Tuck-too' lizard call was heard by us for the first time. More attention is obviously paid to the tea here, the plantations being of a better standard than hitherto seen.

We found a great difference between the Shans who are Buddhists and do not take life, and our former guides the Kachins and Chins, the Shans being obviously not interested in the fauna sought for. That night an amusing incident occurred though rather riling to the writer at the time. The party, 'gooming', had separated and the writer managed to secure our only specimen of the large Yunnanese flying squirrel (*Petaurista*), a fruit bat (*Cynopterus*) and two birds. We were to foregather at midnight on the river-bank. The writer's guide however did not seem to understand this, with the result that camp was not reached till 2 a.m. Every effort to make the guide return to camp only resulted in a long journey in the opposite direction! A few minutes after camp was eventually reached (Rowley and McCann having returned two or three hours earlier) a violent gale suddenly sprang up blowing down mosquito-nets and nearly carrying away a tent off one of the boats. The gale subsided after half an hour as quickly as it had started. The writer, being still fully dressed, was the only member unaffected.

Striking camp early next morning, a collection of eleven *Callosciurus*, eight *Tomeutes* and a gibbon were made on both banks of the river, one of the party collecting as far as Tampao on the west bank was picked up by the boats at noon. At 4 p.m. Rowley and the writer landed on the east bank and walked the rest of the way to Homalin securing two langurs near Kaungkan. McCann with the rafts reached Homalin at 8-30 p.m. Camp was pitched in the compound of the Inspection bungalow where Vernay and Raven were already installed. Here we received an accumulation of mail, Homalin being the northernmost point of call for the Irrawaddy Flotilla steamers. On the 23rd most of the day was spent in going through and re-packing our outfit while in the evening a single *Callosciurus* was collected, nearly white in colour and four bats at night round the bungalow. Collecting was continued on both banks of the river on the following day, the bag from the western bank comprising fourteen specimens of *Tomeutes* and some birds. The scrub jungle in parts seemed to be alive with this species. Quite a large number of coffee trees are grown in the compounds of the houses at Homalin as also in Kaungkan and Kawya. At about 10 p.m. the well-known explorer and botanist, Kingdon Ward, turned up with Tunstell (Mycologist at the Tocklai Tea Station in Assam), having walked through the Naga Hills, and climbed within 2,000 ft. of the summit of Saramathi, the elevation of which is 12,000 ft. Apparently they were unable, for want of time, to climb the last 2,000 ft. but the snow line which was the limit of the forest was reached and here snow was still lying among the rhododendrons which formed the major part of the forest at the higher altitudes. Kingdon Ward and Tunstell, with an escort of twenty Sepoys, and about 120 coolies, reached the Chindwin at Tamanthi having followed the Nantaleik river. They had seen no game and few birds but droppings of either Serow or Goral on the slopes of Saramathi were observed. They spent the next day with us at Homalin. Collections were made during the day on both sides of the river. The *Callosciurus* obtained on the eastern side were nearly white. Successful flashlight photos of the whole party were taken in the bungalow late that night. On the 26th morning Kingdon Ward and Tunstell left in a boat downriver. 'Gooming' after dinner, eight 'Tuck-toos' and two tree-frogs were secured. Villagers brought in a small Himalayan bear cub which was taken over by the writer. On the 27th two gibbons were collected in a patch of evergreen jungle bordering a reservoir near Homalin and a further four specimens of 'white' *Callosciurus* were also added to the collection. In the afternoon all our heavy camp kit was put on board the Irrawaddy Flotilla steamer *Namtu* which had arrived. 'Goomers' that night secured two different specimens of civets, *Viverricula* and *Vivera zibetha.*

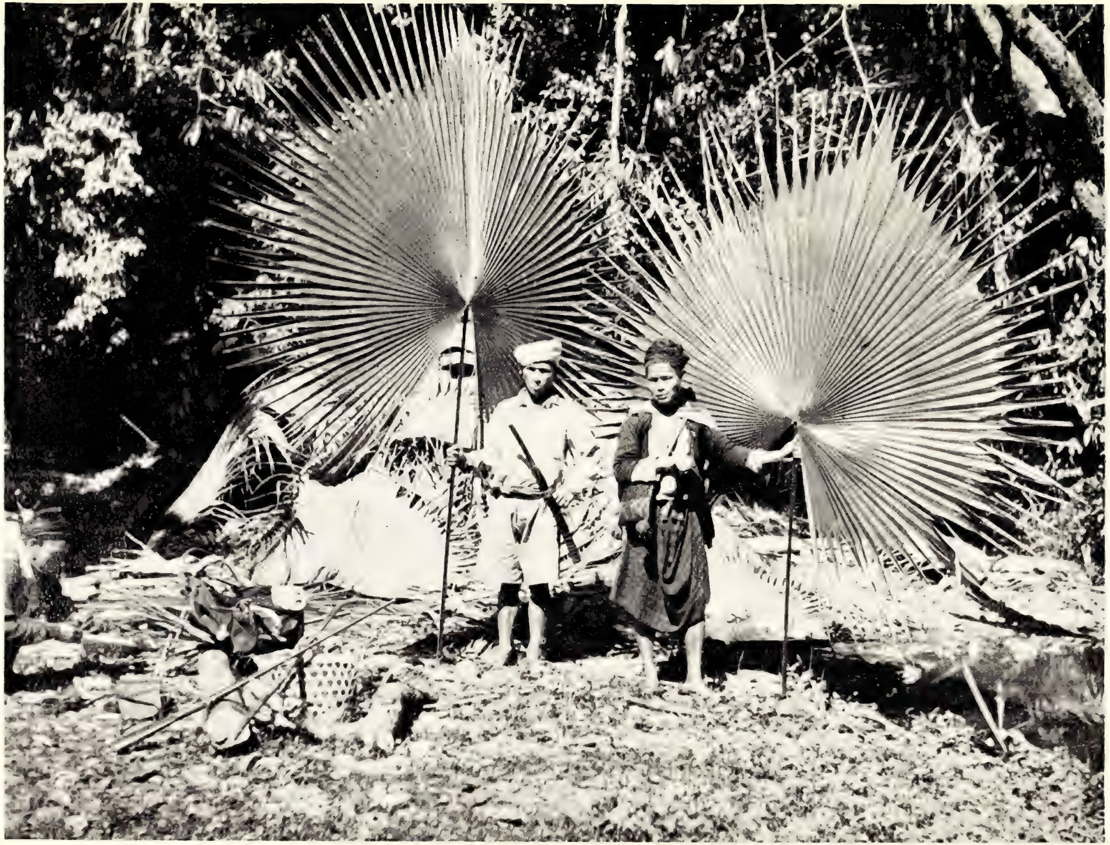
Homalin is quite a large town, the Headquarters of a Sub-Division Officer, on the eastern bank of the Chindwin, boasting in a number of shops mostly owned by Sikhs. The forest on the east bank is composed of small deciduous trees among which are *Careya arborea, Holarrhena antidysenterica, Feronia, Dillenia pentagyna, Zizyphus, Ficus glomerata* and other species of figs, also *Congea, Bombax, Combretum, Elaeocarpus* and a large species of *Smilax* which was in flower. A number of *Meliaceae* and *Rhamnaceae, Apocynaceae* and *Urticaceae* also occur. In the evergreen patches bordering the reservoir and stream the following were noticed:—*Myrtaceae, Araliaceae, Araceae, Scitaminaceae, Palmae,* and *Pygeum.* The last was fairly abundant and in fruit. The stomach of a female gibbon shot at Homalin contained fifty-four fruits of *Pygeum* entire, while the alimentary canal contained numerous seeds of the same kind. In the swamps grasses, *Cyperaceae, Onagraceae* (*Ludwigia*), a species of a rose (white), and the water hyacinth were common, while a willow (*Salix*) was observed along the banks of the stream. Very extensive paddy fields lie round Homalin; cocoanut, betelnut, plantains and pawpaws are also cultivated. The deciduous forest contained large numbers of a species of *Erythrina,* while a species of *Rumex* was common along the river-banks.

By 8-30 a.m. on the following morning all our light luggage had been loaded on the steamer which left Homalin on the last stage of our journey down the Chindwin river. The steamer stopped at four places to pick up cargo and tied up for the night at Phaunglyin passing during the day several of the quaint native craft known as 'Hoolongs'. As we travelled down-river the forest appeared to become more and more deciduous, *Butea frondosa* showing up in full bloom on the eastern side. The river was very shallow in parts and our boat, a stern-wheel paddle steamer, frequently either stuck on or grated over sandbanks. At this time of the year a passage for the steamers is continuously charted and marked out by bamboos painted either red or black. Owing to this all steamers only travel by day. From here onwards Talipot palms, a number of them in flower, were in evidence near villages. The steamer continued the journey down-river calling at several places *en route* including Pantha, where there is a large oil refinery, and Kindat. At noon we passed some very interesting rock formations. Mawlaik was reached at about 7 p.m. and here we had to change steamers. After breakfast next morning the jungle on both sides of the river was visited and four *Callosciurus*, three *Tomeutes*, a *Tamiops*, and several birds were secured. The forests entered were purely deciduous. The following species were common:—*Bombax* sp., *Dillenia pentagyna*, *Randia uliginosa*, *Zizyphus* sp., *Lagerstroemia*, *Elaeocarpus* sp., and some of the *Combretaceae*, *Mimosae* and *Albizzia* also *Butea frondosa*, species of *Ficus*, *Strebulus asper*, *Cassia fistula*, and trees of the *Begnoniaceae*.

The *Callosciurus* collected were unlike *any of those secured hitherto* being dark with rufous tipped tails and a rufous blaze on the forehead, those collected at Homalin being nearly white. The Uyu river joining the Chindwin 3 miles below Homalin apparently forms a barrier to the white squirrel area, the *Callosciurus* on the south and east of the Uyu being more of the type occurring in the interior east of the Chindwin. That night we moved into the larger boat *Sima* which had excellent accommodation and electric lights. The *Sima* was due to travel up river to Pantha, halting at Kindat on the way, and as this provided an opportunity for collecting at Kindat, the writer landed here at 8-30 a.m., and crossed over to the west bank in a dugout with two villagers. During the night while 'gooming' in the Rest House compound a large civet (*Paradoxurus*) was brought down from a fig tree and several 'Tuck-too' lizards caught. Early on the following morning (April 1st) the writer travelled out east, but came to no jungle and hearing the whistle of the steamer had to hurry back, reaching the boat at 7-30 a.m. The villagers informed the writer that there was scrub jungle out further east but that only *Tomeutes* occurred. This was interesting being a complete reversal of conditions, as from Singkaling Hkamti southwards the east bank had been the productive area for *Callosciurus*, the west bank producing mainly *Tomeutes* which were rare on the eastern side. At Mawlaik the east bank again produced *Callosciurus*, only *Tomeutes* occurring on the western side; at Kindat the *Callosciurus* shot on the west bank was dark grey with a grey white tail and chestnut underparts. McCann collected a *Callosciurus* on the east bank at Pantha, similar to the specimen secured at Mawlaik. A number of 'Tuck-too' lizards had also been collected and a leopard cat unfortunately lost.

McCann records that the forests on the eastern bank at Pantha are dry and deciduous except along the banks of streams where evergreen trees occur, the deciduous forests being composed chiefly of the following trees and shrubs:—*Tectona grandis*, *Elaeocarpus* sp., *Gmelina arborea*, *Careya arborea*, *Bassia* sp., *Odina woodiar*, *Butea frondosa*, *Calycopteris floribunda*, *Woodfordia fruticosa*, *Ficus* sp., *Eugenia* sp., *Randia* sp., and a tree of the *Papilonaceae* with a purple bloom. *Gliricidia maculata* was also common.

The civet (*Paradoxurus*) collected at Kindat contained five foetuses. Halting at Mawlaik for a short time the steamer arrived at Kalawa soon after 4 p.m. and here six *Callosciurus* were secured, mostly in the compounds of the houses in the village on the eastern bank, also 11 *Tomeutes* on the western bank. The *Callosciurus* were of the same type as collected at Mawlaik and Pantha. The *Tomeutes* were apparently feeding on the fruit of *Calycopteris*



Leaves of a Palm (*Livistona* (?) sp.).

floribunda. In front of nearly every Burmese and Shan house in these towns and villages stands a long pole headed with a plaited bamboo mat, about 18 in. square, and a crook: apparently it is an unwritten law that one of these has to be maintained in front of every house to beat out fires and pull out burning materials.

Leaving Kalawa at 5 a.m. in the morning the steamer reached Okina on the eastern bank at 4-30 p.m. calling at several villages *en route.* In the evening squirrels and some birds and frogs were collected and after dinner 14 'Tuck-toos' and seven nightjars. The giant squirrels (*Ratufa*) were different to those shot previously being much lighter in colour and smaller. We were now in the typical dry zone of Burma and much of the scrub jungle is similar to that occurring in the dry parts of South India. Leaving at 5 a.m. next morning we arrived at Monywa at 1-30 p.m. and so completed our journey down the Chindwin river and our collection work. Our train left Monywa early next morning, and travelling most comfortably in a special reserved carriage, we arrived at Rangoon on the morning of April 5th, and were met by Hopwood.

Our collection consisted of some 1,000 mammals, 750 birds and a large number of reptiles and fishes. The most interesting side of the collection was definitely the squirrels (*Callosciurus*) which exhibited a remarkably interesting variation in colouration of coat. Those collected on the eastern side of the Chindwin showed the most interesting changes, while the specimens of *Callosciurus* collected on the western side remained far more constant. It is suggested that an explanation for the variety of colour displayed east of the Chindwin might possibly be found in an examination of the flora in the different localities producing the different colour forms. In the dense forest of the northern areas the colouration was definitely darker than those in the lighter deciduous forest further south, continuing down to Homalin, where the *Callosciurus* were almost white. McCann observes that in studying the vegetation it would be necessary to take into consideration the colouration of the bark of the trees and the predominance of either dark or light coloured vegetation, and it would be also necessary to study this in connection with the rainfall figures of the various places. At the time the expedition visited the area the squirrels were observed to be feeding on *Elaeocarpus* sp., and *Pterospermum* sp. An examination of the embryological material collected by Raven would provide interesting information on the breeding season of those animals.

The writer cannot conclude these notes without expressing his obligation to McCann for his notes, of which he has made full use. The botanical notes in this article are almost entirely quoted from his notes as also the opinion expressed on the possible bearing the vegetation in the various localities has on the variation in colouration exhibited by specimens of *Callosciurus* collected east of the Chindwin down to Homalin. The writer cannot but observe however that one obvious hitch to this theory is provided by the colouration of the *Callosciurus* collected south of Homalin which appear to be a definite throw-back to that of specimens collected in the denser jungles of the interior up north, west of the Uyu river.

THE VERNAY SCIENTIFIC SURVEY OF THE EASTERN GHATS.

(Ornithological Section).

BY

Hugh Whistler, M.B.O.U., assisted by N. B. Kinnear, M.B.O.U.

Part XIV.

(*Continued from page* 437 *of this volume*).

Crocopus phoenicopterus chlorogaster (Blyth).

Vinago chlorogaster Blyth, J.A.S.B., vol. xii (1843), p. 167, note—no locality, now restricted to Salem district in South India.

Specimens collected:—144 ♂ 28-4-29 Kurumbapatti; 1022 ♂ 22-11-29 Nallamalai range 2,500 ft.

Measurements:—

	Bill.	Wing.	Tail.	Tarsus.
2 ♂	20-22.5	182-184	100-108.5	24.5 mm.

There is very little definite information about the status and distribution of the Southern Green Pigeon in the Presidency. On the eastern side the above two records are merely supplemented by Dewar's statement that it is not at all common at Madras.

On the west I find the following records. A male in the British Museum was collected by William Davison on 17 February 1881 three miles beyond Seegore (Sigur). There is a male from Malappuram dated 7 April 1912 in Colonel Sparrow's collection.

In the Nelliampathies according to Kinloch the Green Pigeon is very common and locally migratory. He says (*J.B.N.H.S.*, xxvii, 943) that it comes up from the plains towards the beginning of October and in November and December may be found everywhere. Towards the middle of January they start disappearing, presumably going back to the plains and they gradually diminish in numbers till the middle of February when the last stragglers depart. Occasionally a few birds remain in the Nelliampathies till the burst of the S.-W. Monsoon and breed in the hills.

In the Palnis this Green Pigeon appears to be confined to the base. Fairbank says that he obtained it in the avenues of the north base in October 1866 but did not find it at all on his second visit, which suggests that here too there may be local movements. Terry, however, took a fresh egg in the Pittur Valley on 7 April but found the bird no higher up.

Stewart is said to have taken eggs in Travancore in January (*Nidification,* iv, 127) but the species does not occur in Ferguson's list.

It may be remarked that the few specimens I have examined from the Presidency appear to be smaller than the specimens of *chlorigaster* which occur across the central belt of the Peninsula, where males have a wing varying up to 203 mm. in size.

The *Vinago chlorigaster* of Blyth was originally described without any type locality. In the *Annals Mag. Nat. Hist.* 1844, vol. xiv, p. 116, Blyth, however, says in the Birds of Calcutta:—'that of Southern India (*Vinago* or *Treron*) *chlorigaster* nobis I have only once obtained in this part and have received specimens of it from Mr. Jerdon and others.' This clearly fixes the type locality as Southern India and I now further restrict it to Salem district.

Dendrophassa pompadora affinis (Jerdon).

Vinago affinis Jerdon, Madras Jour. Lit. Sci., vol. xii (1840), p. 13—West Coast of India.

The Grey-fronted Green Pigeon was not obtained by the Survey and it is confined to the west coast of India from the extreme south up to, not only North Kanara as given in the *New Fauna* (v, 188) but to Alibag (Sinclair, *J.B.N.H.S.*, xii, 185) and Khandala (Fairbank, *S.F.*, iv, 261) as correctly given in the *Old Fauna*.[1] In this area it is of course a resident species though it moves about locally in accordance with the ripening season of the berries and fruits on which it feeds. The statement that it occurs in the Laccadives is surely an error for Pigeon Island (see Hume, *S.F.*, iv, 424).

In Coorg, according to Betts, large flocks come into the coffee estates from September to Christmas but spend the rest of the year in the jungle. There are two specimens from Coorg in the Tweedale collection as well as two from Calicut. In the Wynaad William Davison obtained a series now in the British Museum and he says that it is found in small flocks in different parts, though nowhere very abundant. It does not ascend the Nilgiris to any height, but is fairly common up to 3,500 ft. On the north side Phythian Adams saw it occasionally at Musnigudi and saw several flocks at Anaikatti 3,000 ft. in September and October.

Kinloch found this Green Pigeon extremely common in the Nelliampathies in February and March but says that it descends to lower levels before the burst of the S.-W. Monsoon. In the Palnis Fairbank obtained it at Periur, where it was coming in flocks to feed on the ripening fruit of *Zizyphus*.

In Travancore this Pigeon is common in the jungles both in the low country and on the hills at low elevations. They ascend higher in February and March, then occurring up to about 3,000 ft.

The breeding season in the Presidency is from January to April. Darling took several nests on the 10th April at 3,000 ft. at the foot of the Terriat hills, 10 miles N.-W. of Vythery, S. Wynaad (*N. & E.*, ii, 375). Phythian Adams took eggs at Anaikatti in February. In the Nelliampathies Kinloch found them breeding almost solely in January and February (*Nidification*, iv, 130). Bourdillon took an egg in the Ashambo Hills on February 24th.

Dendrophassa bicincta bicincta (Jerdon).

Vinago bicincta Jerdon, Madr. Jour. Lit. Sci., vol. xii (1840, after September 22), p. 13—sea coast, south of Tellicherry.

Specimens collected:—1635 ♂ 31-3-30, 1640 ♂ 1-4-30 Sankrametta 3,500 ft.

Measurements:—

	Bill.	Wing.	Tail.	Tarsus.
2 ♂	19	161-164.5	98.5	20 mm.

The Orange-breasted Green Pigeon appears to be fairly generally distributed on both sides of the Presidency though very little is really known about it. Jerdon obtained a female, the type of his *Vinago unicolor* (which he did not then recognise as the female of his *Vinago bicincta*), in a grove of trees at Bimlipatam on the sea coast, not far from Sankrametta where the Survey specimens were obtained. He also states in the Illustrations that he had obtained specimens from the Eastern Ghats west of Nellore and once in the 'Carnatic'.

For the west William Davison (*S.F.*, x, 406) records that he once saw a specimen shot at Cherambady in the Wynaad by a Mrs. F. Hodgson. In Travancore, according to Ferguson, this bird may be met with in the low country not far from the coast.

Nothing is recorded about the breeding season in the Presidency.

There are evidently two races of the Orange-breasted Green Pigeon in India and Ceylon distinguished merely by size. Ceylon birds are very small. 9 males measure: bill 17-19, wing 145-154, tail 88.5-93.5 mm. Himalayan birds, on the other hand, are large and with them must be grouped our Survey birds, and birds from N. Kanara, 6 ♂ measuring bill 16-19, wing 156-164.5, tail 93.5-98.5 mm. There are however unfortunately no birds available from the Malabar Coast to show what is the typical race, whether it agrees with either the large or the small form, or is intermediate between them. Mr. Stuart Baker tries (*New Fauna*, v, 190) to settle the question on the three specimens with no precise locality collected by Jerdon and Baker (wrongly called Baber) in the British Museum. This however is valueless as there is nothing to show whether Jerdon's birds were collected from his northern or southern localities and there is no reason to believe that Baker collected in Ceylon as alleged by Mr. Stuart Baker. There also seems to be no proper evidence for the statement (*Nidification*, iv, 131) that birds from South Travancore belong to the small Ceylon race.

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[1] Since the above was written I see that Mr. Humayun Abdulali has recorded the species from Karnala Fort, Kolaba District on 25 February 1934. *J.B.N.H.S.*, xxxvii, 955.

The Malabar birds must of course be the typical race. There are names available both for the northern and southern (Ceylon) birds. For the former *Vinago unicolor* Jerdon, Madras Jour. Lit. Science, vol. xii, 1840 (after September 22), p. 13—Bimlipatam. For the latter *Treron bicincta leggei* Hartert, Novitates Zool., vol. xvii (1910), p. 193—Ceylon. When Malabar specimens are available the correct names and distributions of the races can be settled.

Ducula badia cuprea (Jerdon).

Carpophaga cuprea Jerdon, Madr. Jour. Lit. Sci., vol. xii (July 1840), p. 12—Wynaad.

Not procured by the Survey. There is a very doubtful record of Jerdon's Imperial Pigeon in Jeypore State (Ball, *S.F.*, v, 418) which supplies the only suggestion that it occurs anywhere in the Eastern Ghats. On the west it is well known. Colonel Baker (*Birds of S. India*, p. 277) has an interesting account of how he met with it at Wotacolly in Coorg, finding it common almost to the foot of the western slopes, though he had not observed it at all on the eastern side of the Ghats. William Davison called it not uncommon in the great forests of the Wynaad and on the slopes of the Nilgiris where Mr. Betts informs me they occur up to about 4,000 ft. Jerdon (*Birds of India*, iii, 458) has something to say about the local migration of the birds from Coorg and the Wynaad, from the middle of April to the first week of June, to the neighbourhood of Cannanore, to feed in a large salt swamp but this swamp now seems to have disappeared.

Kinloch found it very common in the Nelliampathies.

In Travancore Jerdon's Imperial Pigeon is common in the hills in heavy forest at all elevations and a series from Mynall is in the British Museum. A specimen collected in May 1917 by Mr. S. H. Prater in Madura (doubtless in the High Wavy Mountains see *J.B.N.H.S.*, xxv, 290) is in the Society's collection.

Bourdillon was of the opinion that the bird was double-brooded laying in April and again in November, but Stuart Baker (*Nidification*, iv, 139) on the authority of Stewart gives the breeding season as from January to May in Travancore. It is doubtless much the same in Coorg and the Wynaad as Iver Macpherson (*N. & E.*, ii, 368) took eggs in March, April and May, just over the border in Mysore territory.

Muscadivora aenea pusilla (Blyth).

Carpophaga pusilla Blyth, *J.A.S.B.*, vol. xviii (1849), p. 816—Nilgiris.

Specimens collected:—14 ♀ 10-4-29 Kurumbapatti; 291 ♂ 30-5-29 Chitteri range 2,000 ft.; 652 ♂ 4-8-29 Palkonda Hills 1,000 ft.

Measurements:—

	Bill.	Wing.	Tail.	Tarsus.
2 ♂	27-28.5	211-218	139-140	29 mm.
1 ♀	27	202	131	28 mm.

The Green Imperial Pigeon seems to be very generally distributed in small numbers in the Presidency. Ball (*S.F.*, v, 418) tells us that it was found by Captain Blaxland at Paparhandi 1,800 ft., a town in the Jeypore Agency. A male obtained north of Ellore on 6th April 1871 is in the Hume collection and a specimen from Vellikonda, Nellore district, is in the Madras

Museum. On this side the records are completed by the two Survey specimens.

For the west there are a male (2 October 1867) and a female (17 October 1867) from Kullar and an unsexed bird collected at Calicut in 1873, all in the Hume collection. There seem to be no records for the Nilgiris but Major Phythian Adams informs me that he obtained it in July near Kollegal (North Coimbatore) though there were not many about.

In the Nelliampathies it is rare and only occurs, according to Kinloch, towards the foot of the southern slopes.

In Travancore Ferguson says it is only found in forest in the low country. He had never seen it in the hills or away from the coast.

According to Stuart Baker (*Nidification*, iv, 142) eggs have been taken in Travancore by Bourdillon and Stewart from February to April and in June.

In the *New Fauna* (v, 209) Mr. Stuart Baker says that there is a vast area between North and South India where no Green Imperial Pigeons occur. This is not quite correct. I have plotted all the records on a map and find that they extend in an unbroken line from the Eastern Himalayas to Travancore mostly confined to the eastern side, but on the west also occurring up as high as Bombay. In this wide Indian distribution and in Ceylon there is no variation in colour but there is a gradual increase in size from the south to the north. The series available is not properly sexed but the difference in size between Himalayan and Cinghalese birds is considerable:—

	Bill.	Wing.
6 birds Eastern Himalayas	30.5-33.5	232-248 mm.
6 birds Ceylon	29-32	202-213 mm.

This difference is bridged by degrees by the specimens available from the intermediate areas and it does not seem possible to say where one race begins and another ends. Under the circumstances I propose to use the arbitrary boundary of the twentieth degree, which has been already used in a number of similar cases. All Presidency birds may then be known as *M. æ. pusilla* while for the northern birds the name available is *Columba sylvatica* Tickell, J.A.S.B., vol. ii (November 1833), p. 581—Borabhum.

Mr. Stuart Baker has wrongly given the type-locality of *M. æ. pusilla* as Ceylon instead of the Nilgiris and his argument (*loc. cit.*) is affected by this mistake.

Chalcophaps indica indica (Linnaeus).

Columba indica Linnaeus, Syst. Nat., ed. x, vol. i (1758), p. 164—In India orientalis.

Specimens collected:—357 ♀ 7-6-29, 374 ♂ 9-6-29 Chitteri range 2,000 ft.

Measurements:—

	Bill.	Wing.	Tail.	Tarsus.
1 ♂	22	146.5	94.5	25 mm.
1 ♀	21.5	147	91	24 mm.

The Bronze-Winged Dove is better known in the Presidency on the western side. Although normally a forest bird Mr. Betts tells us that in Coorg it is occasionally seen in the well-wooded coffee estates. It occurs in fair numbers according to William Davison in the Wynaad and over the lower slopes of the Nilgiris, ascending in smaller numbers as high as Coonoor on the one side and Neddivattum on the other. Major Phythian Adams informs me that it may often be seen on the Goodalore Ghat. There is a specimen (♂) from Malappuram dated 9-6-12 in Colonel Sparrow's collection.

Kinloch called it very common in the Nelliampathies. In the Palnis Fairbank shot one and saw another at Periur, and Terry obtained a specimen at Pulungi. In Travancore, according to Bourdillon, this bird is common on the hills at all elevations in the dry weather, but at other times is confined to the lower slopes.

On the eastern side the Bronze-winged Dove was found in Panapakkam Forest Reserve, Chittoor district, by Dawson (*J.B.N.H.S.*, xxvi, 671) when a female was shot on 13 February 1919 and two other birds seen. There is a specimen from the Shevaroys in the Madras Museum a locality confirmed by the two specimens collected by the Survey. Mr. LaPersonne reports that the birds were common.

As to the breeding season Mr. J. Darling found a nest with two young ones at Vythery on 7 March 1873 (*N. & E.*, ii, 364). In the Nelliampathies according to Kinloch and in Travancore according to Bourdillon this dove breeds in April and May and again in November and December (*Nidification,* iv, 147). Bourdillon also records two hard-set eggs on January 13th.

There is no difference between birds from North and South India. Ceylon birds are, however, separable as *Chalcophaps indica robinsoni* Stuart Baker on the characters given in the *New Fauna.*

Columba livia intermedia Strickland.

Columba intermedia Strickland, Ann. Mag. Nat. Hist., vol. xiii (January 1844), p. 39—India.

Not reported by the Survey. The Blue Rock Pigeon is evidently much less common and less generally distributed in the Madras Presidency than in Northern India, though I am not sure how far the records convey a true picture of its distribution. On the eastern side it is only recorded in Dewar's list for Madras. On the western side we have two specimens marked Coorg in the Tweedale collection. It may be remarked however that the bird is not included in Bett's Coorg list and these specimens are not altogether satisfactory, being indistinguishable from North Indian birds.

The Blue Rock Pigeon is not included in William Davison's Wynaad and Nilgiri list but two males collected at Coonoor by him on 4 November 1881 and 25 October 1881, that is after the trip whose results are recorded in his paper, are in the British Museum.

In the Palnis Fairbank met with a flock by 'the fall of Levinge's brook' and Terry found a large colony on the cliffs near Pittur. In Travancore, according to Ferguson, this pigeon is common in the low country, frequenting paddy fields. During the dry months these flocks ascend the hills in South Travancore to an elevation of 2,500 ft., feeding up there by day and returning at night to roost in the plains. There is a large colony on a sea-girt rock off Cape Comorin.

Nothing is recorded about the breeding season in this Presidency. The small amount of material from South India for the critical study of this pigeon is far from satisfactory but it appears that the Blue Rock Pigeon is darker and smaller in South India (*intermedia*) and larger and paler in North India (*neglecta*), the two forms grading into each other. Until proper material is, however, available from Central and South India any attempt to define the distribution of the two races is premature.

Columba elphinstonii (Sykes).

Ptilinopus elphinstonii Sykes, P.Z.S. 1832 (November 22), p. 149—Ghauts.

Not met by the Survey. Except for the unconfirmed and unlikely report of its occurrence in Jeypore (Ball, *S.F.*, v, 418) and the statement in the *Birds of South India* (p. 281) that it occurs in the Shevaroys, the Nilgiri Wood Pigeon is only found in the Presidency in the western hills. William Davison reported it as comparatively common in the Brahmagherries. The Wynaad is not high enough for it but in the Nilgiris it is common from about 4,000 ft. upwards, being usually found in pairs though numbers may collect when the fruits of various trees are in season. Its numbers and its movements evidently depend very greatly throughout its range on the berries and fruits on which it feeds. Colonel Sparrow's collection contains a female collected at Kolattur, Malappuram, on 9 December 1912.

This Pigeon does not occur in Kinloch's Nelliampathy list but in the *Birds of S. India* he is quoted as saying that it is found sparsely in those hills. Southwards it is common in the Palnis, from 4,000 ft. upwards, and in all the higher ranges of the Travancore hills. Mr. Prater obtained a specimen, now in the Society's collection, in the High Wavy Hills of Madura on 14 May 1917.

Mr. Stuart Baker (*Nidification,* iv, 154) states that the breeding season in the Presidency lasts from March to July, most eggs being laid in May and June.

Streptopelia orientalis meena Sykes.

Columba meena Sykes, P.Z.S. 1832 (November 22), p. 149—Dukhan.

Although no specimen of the Rufous Turtle-Dove was obtained by the Survey I have thought it desirable to go into the whole question of the distribution and names of our Indian races in view of the different views which have been published on the point and in order to identify the only Presidency specimen available for examination.

There are four difficulties in the matter—so far as our Indian birds are concerned—the lack of reliable information as to where these doves are to be found as breeding birds, the lack of specimens of known breeding birds, the intergradation between the three races, and finally the correct attribution of the available names.

There is no difficulty—save of name—for the bird which breeds as a summer visitor at moderate and high altitudes throughout the Western Himalayas. This is the bird with pale underparts, much white on the belly and white under tail-coverts and white tips to the tail feathers. On its breeding there is plenty of accurate information and there are many specimens available which from their dates and other information may be satisfactorily accepted as breeding birds. As this race is highly migratory its breeding season is well-defined. In winter it vanishes from its breeding territory and moves southwards and eastwards, avoiding however the desert areas of Sindh and Rajputana. Specimens in the British Museum verify its occurrence far south in fair numbers in Western Khandesh (Davidson, *S.F.*, x, 315) and also occasionally at Mahableshwar (♀ May 1874, Fairbank), N. Kanara (♂ 14-3-89, Sirsi James Davidson), and Manantoddy, Wynaad (sex? 10-4-1881, William Davison). Eastwards I have examined specimens from Seoni (♀ 4-3-70 Hume coll.), Mirzapur (sex? March 1869, Thompson), Darbhangha (♂ 8-10-07 Baghownie, ♂ juv. 2-12-03 Anarh, Inglis), and Native Sikkim (♂, sex? April 1874, Mandelli).

The eastern limit of this bird's breeding range is not satisfactorily established. The *Old Fauna* (iv, 42) says that it breeds as far east as Sikkim. Mr. Stuart Baker says (*New Fauna,* v, 240) 'The Himalayas as far east as Western Nepal and then through the lower levels to Sikkim up to 8,000 ft., above which the preceding bird [*orientalis orientalis*] takes its place.' This he amplifies in *Nidification* (iv, 160) by saying that in Sikkim, Stevens saw and obtained birds in early summer at 4,500 ft. though they were not then breeding. There is something wrong about the latter statement as Stevens says very clearly (*J.B.N.H.S.,* xxx, p. 885) that he had failed to meet with this form at all in the Sikkim Himalaya. I cannot find any authority at all for the breeding of this form in the Sikkim Himalaya and both editions of the *Fauna* are manifestly relying on Hume's statement (*N. & E.,* ii, 349) which was perhaps based on the two Mandelli (April) skins. Hume in writing of the Rufous Turtle-Doves appears to have departed from his usual care, for his account of the breeding range in continental India was also evidently written without satisfactory evidence.

My own view is that as a breeding bird this race is confined to the Western Himalayas, and that in Nepal it intergrades into the richly coloured form which is common in Sikkim and the Duars. Scully's account of the Rufous Turtle-Dove in Nepal (*S.F.*, viii, 340) shows clearly that the bird is found as a breeding species and also as a passage migrant from August to December and again in March and April. This is borne out by the series of Scully and Hodgson skins in the British Museum which clearly fall into two groups. One group are typically pale birds, like those of the north-west. Such of these as bear dates were collected in October, November and December and doubtless represent the passage birds of Scully's account. The remainder are intermediate between the west and east Himalayan forms, the pale and the richly coloured and, in my opinion, represent the breeding bird as in several cases Scully has recorded the organs as greatly enlarged. Stevens (*loc. cit.*) describes a breeding pair from the Mai Valley, E. Nepal as intermediate. I am aware of course that Inglis has recorded the pale north-western bird as breeding in Mahdubani subdivision, Bihar (*J.B.N.H.S.*, xiv, 562), but his account suggests that the occurrence was unusual and it is possible that a critical examination of the birds would have shown that they were also intermediate.

To return to the East Himalayan bird. This as I have already stated is very richly coloured with the white of the previous form replaced by grey. It is very close to *S. orientalis orientalis* (Manchuria, Korea, Japan and Tibet) and the *Old Fauna* indeed included both as one form. It may have however been separated from the typical race as more richly coloured, but it certainly grades into it on the one side and into the pale north-west bird on the other. The exact attribution of many specimens to one form or the other is quite impossible.

This richly coloured form—by whatever name it is to be known—is said by Mr. Stuart Baker to breed in Sikkim and the Assam Hills and Burma, though I have not been able to examine any skins known with certainty to be of breeding birds. This form was also believed by Hume to breed in the 'broken belts of hills and forests that stretch across the continent of India from the northern portion of the Western Ghats to Cuttuck' (*N. & E.*, ii, 350) but as regards their breeding in this area the only evidence seems to be Blewitt's account of its breeding in great numbers in Sambalpur.

This bird certainly occurs at Khandala, Mahableshwar, and in N. Kanara on the Western Ghats and at Seoni from all of which places there are specimens in the British Museum. Whether it breeds in these places is hard to make out, as though the skins are dated March, April and May these months in this area might agree with breeding or migration. At Mahableshwar, Fairbank (*S.F.*, iv, 262) says it occurs in the cold season. In North Kanara James Davidson (xii, 62) found it common from November to April and doubted whether it bred. Other records from this area e.g. Satara (Davidson & Wenden, *S.F.*, vii, 86) and Belgaum (Macgregor, *S.F.*, x, 440) throw no light on its status except that it is common.

I feel that until satisfactory evidence of breeding in the Western Ghats is produced it is wiser to consider that both the pale and the richly coloured forms are winter visitors to this area. One thing I feel certain of however, that the birds examined from the Sambalpur, Raipur, Seoni and Western Ghats localities belong to the richly coloured form and not to the typical race which Mr. Stuart Baker says (*New Fauna*, v, 239) 'in winter occurs over the greater part of Eastern India as far west as the Deccan and possibly the Bombay Presidency but, in the north, not west of the United Provinces'. It is not easy to separate the typical race and the richly coloured form while many specimens might belong to either, but I am far from satisfied that the typical race occurs in India at all; at any rate no specimen that I have examined from India proper can, in my opinion, be definitely referred to it.

With regard to the correct names for these Indian forms I do not feel the difficulties which have oppressed certain writers. The oldest name *orientalis* is generally accepted for the Chinese and N. Asiatic bird. The next oldest name is the oft-debated *Columba meena* of Sykes. Kinnear (*Ibis* 1934, p. 97) has recently given the full details of the situation regarding this name. It is evident that Sykes obtained both the pale bird of the north-west and the richly coloured bird of the north-east, which as I have shown, both occur in winter in the area which he was working. The former he took for the male, the latter for the female. The mistake does not invalidate the name which must be used for the supposed male, which comes first in the description and as it was the bird with the white tips to the tail feathers, the name *meena* will stand for the pale bird which breeds in the North-Western Himalayas. The next oldest name in the synonymy of the Rufous Turtle-Dove is *Columba agricola* Tickell, J.A.S.B., vol. ii (November 1833), p. 581—Jungles of Dholbhum and Borabhum.

The description is poor but obviously refers to some form of Rufous Turtle-Dove and as we have at present evidence as to the occurrence of only one form—the richly coloured bird of the north-east—in this area the description and name may be safely taken as applying to it.

There are very few records of the Rufous Turtle-Dove in the Presidency. Jerdon says that he procured it in Goomsoor and in the Bamboo jungles of the Eastern Ghats. There is a specimen from Chingleput in the Madras Museum and another in the British Museum collected by William Davison on 10-4-1881 at Manantoddy in the Wynaad. The last specimen is, as mentioned above, the pale bird of the north which in future I propose to call *S. orientalis meena*. The other records however are more likely to refer to

S. o. agricola and the Madras Museum bird was labelled from the *Old Fauna Turtur orientalis* under which *agricola* was then included.

Streptopelia chinensis suratensis (Gmelin).

Columba suratensis Gmelin, Syst. Nat., vol. i, pt. ii (1789), p. 778—Surat.

Specimens collected:—160 ♀ May 1929 Kurumbapatti; 277 ♀ 24-5-29 Shevaroy Hills 4,000 ft.; 403 ♀ 13-6-29 Chitteri range 3,000 ft.; 771 ♂ 28-8-29 Palkonda Hills 1,000 ft.; 911 ♂ 12-10-29 Seschachalam Hills 2,000 ft.

Measurements:—

	Bill.	Wing.	Tail.	Tarsus.
2 ♂	19-20	141-142	128.5-131	21-21.5 mm.
3 ♀	19-20	132-137	117-124	20-22.5 mm.

I can find no record of the Spotted Dove in the eastern side of the Presidency north of the Godavery Valley. With that exception—which probably does not exist in fact—the Spotted Dove is evidently generally distributed and common throughout the Presidency from sea-level up to a height of about 4,000 ft. and there appears to be no need to quote individual records, though Jerdon's remark that it is rare on the bare Carnatic tableland suggests that there may be local patches of country unsuited to its needs. In the Nilgiris it is said to be common up to about 4,500 ft. and scarce above that height except in the highly-cultivated area between Coonoor and Ootacamund. In the higher Travancore Hills Ferguson considered it a dry weather visitor only.

In the Nilgiris the breeding season is given by Miss Cockburn as March and April, but Cardew says that it breeds from February to September (*N. & E.*, ii, 356). In Travancore Bourdillon gives the breeding season as between April and September.

The Spotted Dove is slightly variable in colour and in the amount of spotting on the back and tertiaries, and south Indian birds average a few millimetres smaller in size. It is not, however possible to divide the birds into two races in India proper. Ceylon birds are definitely smaller and have been separated by Reichenback (Vollst. Naturg. Tauben, pl. 253 b, figs. 3373-3374, 1851) as *ceylonensis* and this race may be maintained, as the following measurements show:—

15 ♂ India (north and south)	135-146.5 mm.
9 ♀ India (north and south)	132-142.5 mm.
5 unsexed, Ceylon	127-133.5 mm.

The three Travancore birds examined (wings 134.5, 138.5, 139) belong to the continental form.

Streptopelia senegalensis cambayensis (Gmelin).

Columba cambayensis Gmelin, Syst. Nat., vol. i, pt. ii (1789), p. 779—Surat.

Specimens collected:—1068 ♂ 9-12-29, 1082 ♂ 10-12-29 Cumbum Valley.

Measurements:—

	Bill.	Wing.	Tail.	Tarsus.
2 ♂	17	121-128	106.5-111	18-18.5 mm.

The Little Brown Dove occurs sparingly on the tableland of the Nilgiris according to William Davison and a few can always be obtained about the Badaga cultivation. Mr. Betts considers that they usually go down to the Mysore plains to breed as they are seldom to be seen in the Nilgiris between April and September.

Fairbank observed it at the base of the Palnis and in the lower hills and Terry specifies that he saw it on the slopes below Pulungi and in the Pittur valley, though it was not common.

In Travancore it is said by Ferguson to be confined to the dry patch of country about Cape Comorin.

On the eastern side there are very few records of the Little Brown Dove—namely the two Survey specimens, Dewar's inclusion of it without comment on his Madras list and Salem. In this last locality Theobald obtained a nest with two eggs at the railway station on August 15th (*N. & E.*, ii, 351). Both the Cumbum Valley birds had the organs much enlarged.

The two males obtained have wings 121-128 mm. and three males in the British Museum from Sigur and Bandipur, close by in Mysore, have wings 125-131 mm. Seven males measured from the Punjab have wings varying from 126-135.5 mm. There is no difference in colour and it is obvious that all Peninsular Indian birds must be kept in the one subspecies.

Streptopelia decaocto decaocto Frivalszky.

Columba risoria var. *decaocto* Frivalszky, A. M. Tarsasag Evkonyvei 1834-36, Bd. iii, Teil 3 (1838), p. 183, pl. viii—Turkei.

Not procured by the Survey. The Indian Ring-Dove appears to be far less common in the Presidency than in other parts of India. On the eastern side it is only recorded by Dewar who includes it in his list without comment.

On the west William Davison says that it is not uncommon about Seegore (Sigur) in the Nilgiris and a male collected by him near there on 18 February 1881 is in the Hume collection. He also adds that many years previously he shot a specimen on the plateau about 7 miles from Ootacamund but this was the only specimen he had found at that elevation.

Fairbank found it in the plains near the Palnis and Terry met with it in the Pittur Valley, but both observers remark that it is not particularly common.

In Travancore Ferguson says it is only to be met in the dry region of the far south, round about Cape Comorin.

There is no information about the breeding season in the Presidency though the bird is presumably a resident. No difference in size or colour exists between the birds of Northern and Southern India.

As Hartert explained (*Nov. Zool.*, xxiii, 1916, pp. 78-80), the time-honoured name *Columba risoria* Linnaeus cannot really be used for the Indian Ring-Dove as it was definitely given to the domesticated dove. This bird is of uncertain origin but may be derived from the African *Streptopelia roseogrisea.*

Oenopopelia tranquebarica tranquebarica (Hermann).

Columba tranquebarica Hermann, Observ. Zool. (1804), p. 200—Tranquebar.

Specimens collected:—1138 ♂ 18-12-29, 1145 19-12-29, Cumbum Valley.

Measurements:—

	Bill.	Wing.	Tail.	Tarsus.
2 ♂	17-17.5	138.5-141	89-90	17-18 mm.

Both the specimens of the Red Turtle-Dove collected by the Survey had the organs greatly enlarged and therefore presumably were breeding. These specimens provide the only records for the Presidency except for Dewar's inclusion of the species without comment in his Madras list and for the type locality Tranquebar.

I do not think it is worth recognising the intermediate subspecies *murmensis* for birds from the Eastern Himalayas and Assam. The two races *tranquebarica* and *humilis* (type locality Bengal), even when extremes from N.-W. India and the Philippines are compared, are far from being as distinct in colour as the *New Fauna* makes out and the colour of the axillaries may be variable. Many individuals certainly cannot be separated. The intermediate race could therefore only be identified by reference to locality.

Pterocles indicus (Gmelin).

Tetrao indicus Gmelin, Syst. Nat., vol. i, pt. ii (1789), p. 755—Coromandel Coast.

Jerdon's statement that the Painted Sandgrouse occurs in the Carnatic doubtless refers to the neighbourhood of Madras city as there are specimens from Madras and Arkonam near Vellore in the Government Museum. A male obtained at Madras in 1876 by Wardlaw-Ramsay is in the British Museum.

It also occurs just inside the Presidency boundary at Anaikatti 3,000 ft. on the northern slopes of the Nilgiris. Here it is found in pairs or small parties of 6 to 8 birds but is not common (Phythian Adams, *apud Birds of S. India*, p. 289).

Pterocles exustus ellioti Bogdanow.

Pterocles ellioti Bogdanow, Mél. Biol. (Bull. Ac. Sci. Petersb.), xi (1881), p. 54—Eritrea, Southern Abyssinia.

The only definite record of the Common Sandgrouse in the Madras Presidency which I have been able to trace apart from Hume's general statement (*Game Birds*, i, 69) that it occurs in the northern and central portions is that by Blanford (*Old Fauna*, iv, 61) 'I have seen many and shot some a little north of the Cauvery near Trichinopoly.' Mr. Stuart Baker (*Game Birds*, ii, 297) states that he has received eggs from Travancore and this no doubt refers to the dry country round Cape Comorin.

Captain C. H. B. Grant who has been working at the races of this species kindly informs me that the above is the correct name of our Indian bird.

Pavo cristatus Linnaeus.

Pavo cristatus Linnaeus, Syst. Nat., ed. x, vol. i (1758), p. 156—India.

The only detailed information about the status of the Peafowl in the Presidency comes from the western side. Here in Coorg it is common in the scrub jungle on the Mysore frontier (Betts). It occurs locally throughout the Wynaad and on the slopes of the Nilgiris up to 4,000 ft. (Davison). Jerdon says it occurs up to 6,000 ft. in the Nilgiris but Hume doubts this (*Game Birds*, i, 82) though he knew of its occurrence as high as Cook's Hill 5,000 ft. Normally it does not breed in the Nilgiris above 2,000 ft. according to the latter. Major Phythian Adams informs me that it is common at Anaikatti and Colonel H. R. Baker (*Birds of S. India*, p. 294) says that it is common at Musnigudi on the Seegore (Sigur) Ghat and also at the foot of the Wynaad Ghats in the Nilambur Valley.

Fairbank observed it at the northern base of the Palnis, in which hills according to Hume (*loc. cit.*) it does not occur over 3,000 ft. As regards Travancore Ferguson states that it was at one time common at the foot of the hills in South Travancore though at that time no longer so: also found on the hills about Pirmeed.

From the eastern side I have no information whatever beyond the fact that the Survey met it in the Salem district in thick dry forests with a liberal sprinkling of boulders and cactus.

Miss Cockburn (*N. & E.*, iii, 407) says that eggs are to be found in the Nilgiris in June and July.

Gallus gallus murghi Robinson and Kloss.

Gallus ferrugineus murghi Robinson & Kloss, Records Ind. Mus., xix (1920), pp. 14-15—Chirala, Gya district, Bihar.

The Red Jungle Fowl is confined in the Presidency to the north-east corner and its range in this area is thus defined by Hume (*Game Birds*, i, 217):—it occupies the whole country north of the Godaveri, Orissa, the Tributary mahals, Ganjam, Vizagapatam and part of the Godaveri district, Joonagurh, Kareall, Nowagurh, Jeypore and other Feudatory States. Jerdon says that he even heard of its being killed south of the Godavery at Cummum, though he was not certain of the correctness of the statement. Jerdon declared it to be very abundant in the Northern Circars and it is surprising therefore that the Survey had nothing to say about it in the Vizagapatam hills.[1] I have seen no specimens from this area and therefore follow Robinson and Kloss in their use of the above name.

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[1] I fear that many sportsmen in the Presidency will consider the account of the Game-birds inadequate, either because their own experience has told them a great deal about the distribution and numbers of the various species which has nowhere been recorded in print; or because increase of human population, opening up of the country by cultivation and the motor-car and the repeal of the Arms Act has materially altered the distribution and status of various species. I can only urge them to put their experience on record in the pages of the *Journal*.

Gallus sonneratii Temminck.

Gallus sonneratii Temminck, Pig. et Gall., vol. ii (1813), p. 246—India, now restricted to the Eastern Ghats near Madras.

Specimens collected:—16 ♀ 10-4-29 Kurumbapatti; 477 ♂ 24-6-29 Tirthamalai 1,000 ft.

Measurements:—

	Bill.	Wing.	Tail.	Tarsus.
1 ♂ ad.	32	235	387	79 mm.
1 ♀	31	207	132	67 mm.

Spur of male measures from base to tip in direct line 36 mm.

Jerdon states that the Grey Jungle-Fowl is common in suitable localities on the Eastern Ghats from about the line of the lower Godavery and on the various isolated ranges of hills in the south of India. He adds that it is not rare in the Naggery hills near Madras and is constantly brought for sale to the Madras market. William Davison (*apud* Hume and Marshall, i, 234) also remarks that numbers are brought in to the Madras market from the Red Hills. LaPersonne reports it to be fairly common in all the Reserved Forests in the district of Salem, ascending the hills to about 3,000 ft. or higher where suitable jungle exists. Except for the above statements I can find no detailed information as to the exact range on the eastern side of the Presidency.

On the west the Grey Jungle-Fowl is more numerous, more widely distributed and better known. In Coorg and the Wynaad, in parts of Calicut district, throughout the Nilgiris, in the Walliar jungles, the Nelliampathies, Anamallais, Palnis and the whole of the Travancore Hills the bird is so generally distributed and so often recorded that there is no need to give the individual records. It occurs at all altitudes in the hills from their lowest slopes to their summits, but is scarce above 5,000 ft.

Opinions differ as to the breeding season from which the deduction may be fairly drawn that it is very irregular and extended unless Hume was right in his suggestion that it differs locally according to the parts of the hills subject to the influence of the north-east and south-west monsoons. Miss Cockburn at Kotagherry called it March to April. Waite at Coonoor said May and June. Davison at Neddivattum said October, November and December. Colonel H. R. Baker says February to the end of June, most nests being found in April and May. In the Nelliampathies Kinloch says it extends from February to October, while Stuart Baker, on the authority of Bourdillon and Stewart, says that in Travancore it is from March to July.

Excellent accounts of the habits of this Jungle-Fowl and of the sport that it affords in the Presidency are available; see for instance Davison, *Stray Feathers*, x, 409; Hume and Marshall, *Game Birds*, vol. i, pp. 231-239; Stuart Baker, *Game Birds*, pp. 156-162 and Colonel H. R. Baker, *Birds of S. India*, pp. 298-300.

Galloperdix spadicea spadicea (Gmelin).

Tetrao spadiceus Gmelin, Syst. Nat., vol. i, pt. ii (1789), p. 759—Madagascar *errore*—Nilgiris.[1]

Specimens collected:—44 ♀ 13-4-29, 81 ♂ 18-4-29 Kurumbapatti; 213 ♂ 12-5-29 Shevaroys 3,500 ft.; 704 [♀] 17-8-29 Palkonda Hills 1,000 ft.

Measurements:—

	Bill.	Wing.	Tail.	Tarsus.
2 ♂	21.5-23	153-161	130-133	43 mm.
2 ♀	21-21.5	140-147	105-123	40-42.5 mm.

No specimen has more than two spurs on one leg.

The Red Spur-Fowl is very widely distributed in the Presidency. It is found at Gumsoor and in the Northern Circars according to Jerdon and Hume though the former says that in the less wooded ranges of the Eastern Ghats it is rare, being mostly replaced by the Painted Spur-Fowl. A specimen from Rajahmundri (♂ 4-4-1871, Blanford) is in the British Museum. Hume's statement (*Game Birds*, vol. i, 248) that it is found even in the low hills of Madras itself—no doubt the basis for Dewar's inclusion of the species in his list—is now amplified by the specimens collected by the Survey in the Palkondas and Shevaroys as well as at Kurumbapatti.

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[1] Restricted to Nilgiris, Stuart Baker, *J.B.N.H.S.*, xxviii, 844.

On the western side Betts says that the Red Spur-Fowl is common everywhere in Coorg, even in cultivated land where there is sufficient cover in the form of lantana scrub. It is also found throughout the Wynaad and the lower slopes of the Nilgiris up to about 5,000 ft., occurring also in smaller numbers to the summits where it has actually been shot at 7,500 ft. (Hume, *loc. cit.*). William Davison remarks (in 1883) on the improvement in their numbers since the introduction of a close season. In this area it presumably also occurs down to sea-level as there are a pair from Calicut in the Hume collection.

The breeding season in the Nilgiris is in February, March and April according to Miss Cockburn and in May and June according to William Davison.

Galloperdix spadicea stewarti Stuart Baker.

Galloperdix spadicea stewarti Stuart Baker, Bull. B.O.C., vol. xl (1919), p. 18—Travancore.

In Travancore this race of the Red Spur-Fowl is said by Ferguson to be common throughout the low country wherever there is forest. According to him it frequents the base of the hills and does not ascend them, but Elwes (*Ibis* 1870, p. 528) says that he occasionally saw the bird up in the Cardamom Hills and Stuart Baker (*Nidification*, iv, 228) says that it occurs in great numbers up to about 3,500 ft. The breeding season is said to be very regular extending from January to the end of March or early April and Bourdillon took c/2 fresh eggs on 6th September.

The Red Spur-Fowl is also found in the Palnis as recorded by Fairbank and Terry. The latter found it common at Pittur. It is also very common everywhere in the Nelliampathies, according to Kinloch, and Stuart Baker (*Nidification,* iv, 227) adds that Kinloch found them up to 4,000 ft. The latter took a clutch of eggs in July. No specimens are available for the racial identification of birds from the Palnis and Nelliampathies but from the analogy of other species I expect they will prove to belong to the Travancore race.

Galloperdix lunulata Valenciennes.

Perdix lunulata Valenciennes, Dict. Sci. Nat., vol. xxxviii (1825), p. 446—Bengal.

Specimens collected:—451 ♂ 20-6-29, 478 ♂ 24-6-29 Tirthamalai 1,000 ft.; 565 ♀ 20-7-29 Gingee; 824-5 ♀♂ 17-9-29, 829 ♂ 18-9-29, 831 ♀ 19-9-29 Kodur.

Measurements:—

	Bill.	Wing.	Tail.	Tarsus.
4 ♂	22-23	148-154	111-122	40-45 mm.
3 ♀	21-21.5	132-142	99-106.5	35.5-43.5 mm.

No specimen has more than two spurs on one leg.

Although Jerdon tells us that the Painted Spur-Fowl is found all along the Eastern Ghats, and I have no doubt that it is common throughout their extent, we have no actual record in the Presidency from north of the Godavery Valley. Here Mr. R. Thompson found it in the hills north of Rajahmundry. From there southwards it is found, as Hume enumerates (*Game Birds*, i, 256) in the Nallamallai Hills, in Kurnool, in Bellary, Cuddapah, the Eastern Ghats inland of Nellore, about Tutapur and southwards to near Pondicherry. The gap in this enumeration is filled by the Survey specimens and LaPersonne also reported that it was very common in the Palkonda Hills at varying altitudes where suitable jungle occurs, and also common in the forest reserves of Salem district, chiefly found at low elevations but occurring as high as 4,000 ft. in the Shevaroys.

It also occurs at Pondicherry which is the type locality for the synonym *Francolinus nivosus* of Delessert, Mag. de Zoöl., 1840, Ois., p. 18, and two male cotypes are in the Museum of Comparative Zoology at Harvard College, vide *Bulletin* lxx, No. 4 (1930), p. 157, of that Museum.

In the western side of the Presidency the Painted Spur-Fowl is only recorded from the circumference of the Nilgiris and in the Palghat district. Hume says it has been found between Metapolliam and Burliar, between Burliar and Coonoor, near Kullar, in the orange valley below Kotagiri. On this side it appears to be very scarce. Two males, marked 17-9-1876 Metapolliam (Wardlaw-Ramsay) and 11-11-1883 Coonoor (Davison) are in the British Museum. On the northern circumference Morgan (*S.F.*, ii, 532) says that he had seen and shot it at various times on the Seegore (Sigur) Ghat and Major Phythian Adams informs me that it is not uncommon at Anaikatti.

It also occurs south of the Nilgiris in the Palghat district and Hume (*loc. cit.* and *N. & E.*, iii, 425) received several specimens thence, apparently from the Walliar jungles.

Nothing very definite seems to be known about the breeding season in the Presidency but Col. H. R. Baker took eggs in the Eastern Ghats on 18th June (*Nidification*, iv, 230).

Excalfactoria chinensis chinensis (Linnaeus).

Tetrao chinensis Linn., Syst. Nat., ed. xii, vol. i (1766), p. 27—Nankin, China.

Not procured by the Survey. The Blue-breasted Quail does not appear to have been recorded from the Presidency further north than 'the Carnatic' where Jerdon says he once procured it. Dewar includes it without remark in his Madras list but these two vague records are substantiated by Mr. F. Bidie (*S.F.*, ix, 208) who, whilst snipe-shooting near Goodavancherrie in Chingleput, killed a pair in December.

On the west William Davison tells us that he met with it sparingly through the grassy portions of the Wynaad. Ferguson says also that it occurs in the grass lands of Pirmeed in Travancore.

This quail is to some extent migratory and its status in the Presidency is not yet known. I can find no difference between Indian and Chinese birds.

Coturnix coturnix (Linnaeus).

Tetrao coturnix Linnaeus, Syst. Nat., ed. x, vol. i (1758), p. 161—Sweden.

The Common or Grey Quail was not procured by the Survey, and the Presidency appears to be beyond the reach of its ordinary migrations. On the eastern side it is only recorded by Dewar who includes it in his list without comment.

On the west William Davison says that he shot a female within 3 miles of Ootacamund on 14 January 1881, and that in former years he had met with them in the Nilgiris on a few occasions.

The footnote in Hume and Marshall (vol. ii, p. 133) regarding the occurrence of Quail in Travancore, which is apparently the basis for Ferguson's suggestion that the Grey Quail may occur on the grass lands of Pirmeed, is only doubtfully referable to this species.

No specimens are available for racial identification.

Coturnix coromandelicus (Gmelin).

Tetrao coromandelicus Gmelin, Syst. Nat., vol. i, pt. ii (1789), p. 764—Coromandel coast.

Not procured by the Survey. There is very little on record about the status and distribution of the Black-breasted Quail in the Presidency. On the eastern side it is only recorded from Madras, where Dewar includes it in his list without comment. There are in the British Museum several Madras specimens collected by Wardlaw-Ramsay, and the only dated skins were obtained in June. A partial albino in the Madras Museum is described by W. F. Dique in *Stray Feathers*, ix, 508.

On the western side William Davison says it occurs in the Wynaad and mentions that he once shot one out of a small covey on the edge of the Government Cinchona plantations at Neddivattum and another bird in Ootacamund.

This quail does not figure in Ferguson's Travancore list but there are two males in the British Museum, collected in Travancore, apparently near Trivandrum by Fry.

Perdicula asiatica asiatica (Latham).

Perdix asiatica Latham, Index Orn., vol. ii (1790), p. 649—Mahratta region, now restricted to Poona.

Specimens collected:—463-4 [♂] ♂ 23-6-29 Tirthamalai 1,000 ft.; 663 ♀ 7-8-29, 749 [♀] 25-8-29 Palkonda Hills 1,000 ft.; 902 ♂ 11-10-29 Seschachalam Hills 2,000 ft.

Measurements:—

	Bill.	Wing.	Tail.	Tarsus.
3 ♂	13-14	82-85	39-41	23.5-26 mm.
2 ♀	13-14	83.5-86.5	40-41	23-24 mm.

There is still a good deal to learn of the distribution of the Jungle Bush-quail in the Presidency and I have so far found no definite record of its occurrence north of the Palkonda and Seschachalam Hills, in the former of which LaPersonne remarks that it was in small coveys on bare hillsides. LaPersonne did however come across coveys of some species of quail—which may well have been this though no specimens were obtained—both in open scrub jungle and in thick forest in the Vizagapatam area at Sankrametta.

Jerdon considered this quail rare in the low Carnatic but in addition to the two Survey specimens from Tirthamalai there is another Salem district specimen in the British Museum, a male collected at Pothanore on 18 October 1868 by Carter. It evidently occurs commonly in the Tinnevelly district as Ferguson states that numbers were caught there and brought alive for sale in Trivandrum. He was doubtful whether this species occurred at all in Travancore, except possibly in the dry area round Cape Comorin but according to Stuart Baker (*Nidification*, iv, 240) Stewart found them breeding from January to March, most eggs being laid in February. The area is not specified.

The only other information about the Jungle Bush-quail I find on the west is a female in the Sparrow collection obtained at Malappuram on 16 July 1912 (of which more anon), a male and two females in the British Museum collected by William Davison near Seegore on 22 February 1881 and Hume's statement (*Game Birds*, ii, 111) that he had seen a specimen from the Wynaad.

In his review of this genus (*J.B.N.H.S.*, xxix, p. 310) Mr. Stuart Baker first introduced the theory that the Rock Bush-quail and the Jungle Bush-quail are merely two races of one species, a theory which is somewhat surprising in view of the fact that both forms are found to coincide in their distribution over a considerable part of India. He accounts for this theory by stating that the two birds normally occupy a different type of terrain, that the two forms grade into each other and that intermediates are not uncommon. The last are said to occur in intermediate country and form the link between two sub-species which are probably of very recent origin. *P. asiatica* he says breeds in places fairly well covered with jungle of some kind whereas *argoondah* breeds in rocky open upland or bare plains. The intermediate country here apparently means the country intermediate in character between the two distinctive terrains described, which are both found here and there over most of India. This conception is an intelligible if unlikely one. In the *New Fauna* (v, 376) however the conception changes. 'The distribution of the two, he says, is most puzzling, as they constantly overlap, but many individuals are exactly half way between the two and it would seem that, whilst the extremes are very distinct, there is an immense intervening area where there is no really constant form.' This, if it means anything, can only mean that on one edge of the range *asiatica* is found, on the other edge *argoondah* and that the intermediates are found (not on the intermediate country between two types of country, both found all over the range as in the earlier conception but) over an immense area at their point of junction.

The difficulties obviously inherent in these mutually destructive theories have made me examine the case of these two forms with particular care and I have been able to supplement the British Museum series with nearly 50 extra specimens from my own collection or through the kindness of Mr. H. W. Waite, Mr. E. A. D'Abreu, Mr. Salim A. Ali, Colonel R. Sparrow and the Society. As a result I find myself in complete disagreement with Mr. Stuart Baker. In the first place the intermediate specimens which apparently gave rise to his theory and which are necessitated by it do not exist in fact. There is no intergrading between adults of *asiatica* and *argoondah*. Both remain true to type and are easily separable. What Mr. Stuart Baker has mistaken for intermediates are immature birds of both forms. Their plumage stages are not at present easily worked out, chiefly because of the unreliable sexing of many specimens, and without previous experience the identification of these young birds is not altogether easy. Adults are easily identified throughout the whole range and there is no ground at all for suggesting that an area of true *asiatica* is separated from an area of true *argoondah* by an immense intermediate area in which variable birds, inclining some to one form some to the other, are found.

In the *Old Fauna, asiatica* and *argoondah* were treated as two straightforward species which could be easily separated and identified. This conception seems to me entirely correct. The males have certainly a general resemblance but no one with any experience of the genus could fail to identify every specimen on the characters given. The females on the other hand differ very widely in plumage pattern and the differences are of kind rather than degree, i.e. specific rather than subspecific. The decisive factor, however, is even stronger than this. *P. argoondah* is the form with the more restricted distribution. This distribution is such that one would not expect it to lead to the development of races and it has not in fact done so. In all parts of its range *argoondah* is invariable in size and colour. *P. asiatica,* on the other hand, has a much wider distribution, a distribution that has rendered it liable to the formation of races of its own, though these have hitherto not been named. These follow the ordinary lines of racial development in widely distributed Indian birds. There is an island race in Ceylon, a richly-coloured race on the western coast, whilst in the Peninsula proper there is a definite grading in colour and size from north to south. If *asiatica* has its own races, and *argoondah* occupies a portion of the range of *asiatica* alongside it, the obvious deduction is that the two forms are separate species, and not races of each other. As such I shall treat them.

The differences in the two races which I am about to name were noticed long ago by Legge (*Birds of Ceylon*, p. 753) and Hume (*S.F.*, ix, 77) respectively. In Ceylon the upper plumage of both sexes is much darker throughout, with the black blotching and the pale shaft-streaks of the scapulars reduced in extent so that these parts do not contrast so strongly with the rest of the plumage as in the typical race. The chestnut throat-patch is also far darker than in the typical race. For this race I propose the name

PERDICULA ASIATICA CEYLONENSIS subsp. nov.

Type:—♂ adult 1894 Cocoawattee, Ceylon (Butler), British Museum register No. 1916.9.20.503.

The second race is based on the fine series collected by Vidal in the South Konkan. These birds, both adult and immature, differ from the typical race in the deep reddish tint of the whole upper plumage, which is even more particularly marked on the crown. In the adult males the black barring of the lower plumage is broader than in the typical form. This race may be known as

PERDICULA ASIATICA VIDALI subsp. nov.

Type:—♂ adult 22 February 1879, Kelsi, S. Konkan (Vidal), British Museum register No. 1889.5.10.658.

This race probably extends down the Malabar coast to Travancore as the only specimen I have seen from this area, the bird in Colonel Sparrow's collection from Malappuram, is of the same red colour. The three Nilgiri specimens examined, being from the northern face of Seegore, do not of course belong to it.

As regards the grading in size and colour from north to south in the rest of the Peninsula, I am at present content to point it out. More specimens from Southern India may show that a horizontal division into races is desirable.

Perdicula argoondah (Sykes).

Coturnix argoondah Sykes, P.Z.S. 1832 (November 22), p. 153—Dukhan.

The *New Fauna* states that the Rock Bush-quail is found in the south-east of India from Madras to the extreme south. This statement is no doubt based on Hume and Marshall (*Game Birds,* ii, p. 117) who say 'it occurs in the Peninsula on the eastern side down to the extreme south and in all the drier eastern Madras districts and even near Coimbatore.' There is a female from Coimbatore dated 3 October 1868 (Theobald) in the Hume collection but I have seen no other direct evidence of the occurrence of this species in the Presidency and it is possible that there is some mistake. It will be remembered that Jerdon transposes the names of these two quails and some confusion has in consequence probably crept into the records. It is to be hoped that local observers will clear up the point.

Cryptoplectron erythrorhynchum erythrorhynchum (Sykes).

Coturnix erythrorhynchum Sykes, P.Z.S. 1832 (November 22), p. 153—Valley of Karley, Dukhan.

Not met by the Survey. The Painted Bush-quail is a very characteristic species on the hills of the western side of the Presidency. In Coorg it is somewhat scarce, according to Betts, though occasional coveys may be met with dusting on the roads. In the Wynaad William Davison calls it not uncommon and in the Nilgiris it is—or was for it is now scarce near Ootacamund—abundant everywhere, apparently at all elevations. An exhaustive account of the habits in this area by Davison and Miss Cockburn will be found in Hume and Marshall (ii, p. 123) and it may be supplemented by a note from Primrose (*J.B.N.H.S.,* xxiv, p. 596). Kinloch found it in large numbers on the Lily Downs 4,000 ft. in the Nelliampathies.

In the Palnis Fairbank met it in Kodaikanal and Terry called it fairly common in places though never numerous enough to allow of a decent bag being made.

In Travancore Ferguson says he only met with it on the Cardamom Hills and the High Range.

The only record of the Painted Bush-quail on the eastern side of the Presidency comes from Yercaud where W. Mahon Daly (*J.B.N.H.S.*, ii, 149) describes an instance of its bravery in defence of its young.

The breeding season seems to be very extended. Miss Cockburn gives January, February, March and September-October as the months for eggs in the Nilgiris. Darling says August to November for the Wynaad and Nilgiris. In Travancore Bourdillon is said to have obtained eggs in January and February, July to September and in December.

Francolinus pictus pictus (Jardine and Selby).

Perdix picta Jardine & Selby, Illustr. Orn. (April 1828), pl. 50—Bangalore.

It is curious that the Painted Partridge was not procured by the Survey as the evidence goes to suggest that it is, or was, generally distributed through much of the eastern side of the Presidency. Jerdon says that the Painted Partridge occurs throughout Chota Nagpur to the more open parts of the Northern Circars, as far as Cuttuck. I am not clear how much of the Presidency this is meant to include but according to Hume (*Game Birds*, ii, 20) it occurs in hilly semi-jungle country and where there is much grass in the Kistna and other more northern districts right up to the Goomsur taluka of the Ganjam district. He also states that it occurs in the Godavari district and it certainly occurs in parts of the upland talukas of the Masulipatam district (Horsfall, *S.F.*, ix, 208), a statement which is corroborated by a skin in the British Museum collected on 20 April 1880.

South of this again, we learn from Hume, the Painted Partridge was shot in the Anamalai Hills of the Kurnool district (Mr. Cardozo), about the Ramandroog and Sandur jungles of the Bellary district (Mr. Gordon, Mr. Cardozo and Captain Bellis) and on both sides of the Eastern Ghats in the Cuddapah and Nellore districts. There then appears to be a break in its distribution and Hume quotes Theobald as authority for its occurrence in the Coimbatore district where it is found about the jungles called Nuddacovil between Kollegal and Bhavani in Northern Coimbatore. It can be heard in several parts of the jungle of the Kollegal taluka.

I am quite unable to understand the distribution of the two races of the Painted Partridge as defined in the *New Fauna.* There must have been some muddle in the type setting. I do not feel quite certain that *Francolinus pictus pallidus* is a sufficiently good race to be worth maintaining. Specimens from Deesa, Anandra, Jhansi, Bundelkund, Ahmedabad and Neemuch in the British Museum do, perhaps, appear a little paler than those from further south and as a series perhaps justify the keeping up over the name *pallidus.* Mr. Stuart Baker has, however, overlooked a far better race in Ceylon. The three specimens from Ceylon in the British Museum differ from the typical race in the much darker brown tint of the upper plumage with the spotting on the back of the neck and the white edging of the mantle and scapulars much reduced. The lower plumage is also much more heavily marked with black, that of the female being much more definitely barred than in the typical race. If these specimens are representative the sexes differ more than in the continental race. Legge (p. 745) had already suggested that the Cinghalese bird might prove separable. So I now carry out his expressed desire that the race if separated should be called after Colonel Watson, one of the noted old shikaris in Ceylon. It will stand as *Francolinus pictus watsoni* Legge, Birds of Ceylon, vol. iii (1880), p. 745—Wellemade, Ceylon.

Attention may be drawn to the two specimens labelled 'Bihar' (Hodgson) in the British Museum. They are said to be hybrids with *Francolinus vulgaris* but this appears to me unlikely and the birds may represent an unnamed race from the north-eastern area. Further specimens of this partridge from different parts of its range are clearly needed for examination, both for the accurate study of its races and for a complete understanding of its plumages.

Francolinus pondicerianus pondicerianus (Gmelin).

Tetrao pondicerianus Gmelin, Syst. Nat., vol. i, pt. ii (1789), p. 760—Pondicherry.

Specimens collected:—469 ♂ 11-6-29 Chitteri range 3,000 ft.; 472-474 ♂♂♂ imm. 23-6-29, 479 ♂ imm. 24-6-29 Tirthamalai 1,000 ft.; 596 ♀ 24-7-29 Tindivanum.

Measurements:—

	Bill.	Wing.	Tail.	Tarsus.
1 ♂ ad.	25	153	83	46.5 mm.
4 ♂ imm.	24.5-25	moult	66-74	40-42 mm.
1 ♀	25.5	moult	72	39 mm.

I can find no information at all as to whether the Grey Partridge occurs in the north-east side of the Presidency anywhere further north of Madras where Dewar includes the name without comment in his list. From there southwards it appears to be common—occurring certainly up to 3,000 ft.—as La Personne reports that it is netted on a fairly large scale in the zamindari forests. The professional netters, he says, wander from district to district like the Persian gypsies. Their outfit consists of a cow and a single long net some 10 to 15 ft. in width. The method adopted is simplicity itself. The cow is let loose in a field frequented by partridges and one man covered with an old cow-hide walks alongside her. The cow is trained to turn to right or left as she is nudged and by this means she is used to drive the partridges gradually towards an opening where the net has been placed.

The Grey Partridge is also doubtless common in the area south of that worked by the Survey as Hume records it from Rameswaram Island (*S.F.*, iv, 459), shot it at Tuticorin (♂ 11-3-75 in the British Museum) and saw it within a stone's throw of the square beacon that marks the southernmost extremity of the Peninsula (*Game Birds*, ii, 51). It is in fact fairly common in the neighbourhood of Cape Comorin (Ferguson), the only part of Travancore suited to it.

The only other part of the western side of the Presidency where I know of its occurrence is on the slopes of the Nilgiris where William Davison says it occurs sparingly on the Sigur side. He says up to 5,000 ft., evidently referring to the straggler killed at Kalhatty (Hume and Marshall, ii. 51) but Hume gives a more conservative estimate of 1,500 ft. as the normal upper limit on this side. Colonel H. R. Baker considers it common round Musnigudi.

Nothing has been recorded as to the breeding season in the Presidency but LaPersonne saw a young brood with the parents in the Chitteri range at 3,000 ft. in June.

Turnix suscitator taigoor (Sykes).

Hemipodius taigoor Sykes, P.Z.S. 1832 (November), p. 155—Dukhan.
Specimen collected:—80 ♀ 18-4-29 Kurumbapatti.

Measurements:—

	Bill.	Wing.	Tail.	Tarsus.
1 ♀	14	86.5	36	22 mm.

The Common Bustard-quail is found, according to Hume (*Game Birds,* ii, 170), throughout the Madras Presidency and in Travancore, but there is not much evidence in support of this somewhat sweeping assertion. On the eastern side I can find no record of its occurrence north of that very vague locality the Carnatic. Here according to Jerdon there was a practice of snaring females with a decoy and in this way he had known 12 to 20 birds occasionally captured in a day, which suggests that the species was fairly common. A specimen from Chingleput in the Madras Museum and the statement by Theobald (*N.* & *E.*, iii, p. 367) that he had taken the nest at Ahtoor in the Shevaroys completes the evidence from this side.

On the west Major Phythian Adams shot one from a couple on partly flooded paddy stubble near Cannanore in September 1927 (*Birds of S. India*, p. 321). A specimen collected by Theobald on 26 October 1868 at Coimbatore is in the Hume collection. Fairbank says that he observed the species in gram fields near the base of the Palnis and Ferguson says that it is not uncommon in scrub jungle in the low country of Travancore.

Five specimens from 'Madras' in the British Museum (Jerdon, Gould, Hume collection) and a female collected by Nair on 15 February 1899 at Pudmanabhapuram (a locality which I cannot find but presume to be in Travancore) complete the evidence for the Presidency.

The breeding season in the Carnatic is said by Jerdon to be from July to September and Theobald's eggs were taken at Ahtoor on 20 August. The Survey specimen collected at Kurumbapatti on 18 April, however, contained an egg ready for expulsion.

As regards the race or races of this Bustard-quail which occur in the Presidency I suffer from the difficulty of lack of proper material. The only two specimens with proper data (Coimbatore, Kurumbapatti) are clearly referable to the race *taigoor*. The five 'Madras' birds on the other hand agree with specimens from Belgaum and Dapuli, S. Konkan in the British Museum which seem to me very red and suggest the possibility of an erythristic race on the West coast, as in the case of *Perdicula asiatica*.

The Pudmanabhapuram bird, on the other hand, cannot be distinguished from the Cinghalese race *Turnix suscitator leggei,* but perhaps this unidentified locality is really in Ceylon. There is also much individual variation in these Bustard-quails and it is to be hoped that observers in the Presidency will make a point of collecting some fresh material to settle these difficulties.

I should like also to direct the attention of observers to the breeding habits of this genus. So far as Indian literature is concerned there is not much exact evidence to support the full accounts given of their polyandrous habits. The proved pugnacity of the females is after all not necessarily inconsistent with monogamy and both sexes have certainly been found brooding eggs, a practice denied to the female in the current accounts.

[**Turnix sylvatica dussumier** (Temm. and Lang.).

Hemipodius dussumier Temminck and Lang., Planch. Color. d'Ois., livr. 76 (1828), pl. 454, fig. 2—Bengal.

According to the *New Fauna* (vol. v, p. 452) the Little Button-quail occurs on the Nilgiris and hills of Southern India everywhere up to the peaks, though this statement is modified by the author in *Game Birds* (vol. iii, p. 32) to the effect that it is extremely rare on the highest parts of the Nilgiris. Mr. Stuart Baker also states (*Nidification*, iv, 286) that Stewart twice found it breeding in Travancore. As these statements conflict with the experience of Davison, Bourdillon, Ferguson and others who worked these areas carefully for years and as the identification of Button-quail is a notoriously difficult matter, I am not yet inclined to admit this species to the Presidency list.]

Turnix tanki tanki Blyth.

Turnix tanki Blyth, J.A.S.B., xii (1843), p. 180—no locality = Bengal.

Specimens collected:—45 ♂ 13-4-29 Kurumbapatti; 1588-9 ♀♂ 24-3-30 Sankrametta 3,000 ft.

Measurements:—

	Bill.	Wing.	Tail.	Tarsus.
2 ♂	13.5-14	82-84	27.5-30	23 mm.
1 ♀	14	93.5	31.5	24 mm.

Jerdon says that the Indian Button-quail is not uncommon in the upland districts of Malabar and in the Eastern Ghats and this statement is apparently roughly correct. On the eastern side the Survey obtained the above specimens at Sankrametta and Kurumbapatti and Stuart Baker states (*Nidification*, iv, 287) that he had received birds and eggs from Tinnevelly. Hume received a skin from Bourdillon from S. Travancore (Hume and Marshall, ii, 187) and Terry states that he shot one at Pulungi in the Palnis. Stuart Baker states (*New Fauna*, v, 456) that in this area it occurs up to 4,000 ft. but I know not on what authority. William Davison collected a male on 13 May 1881 at Karote at the foot of the Banasore Peak in the Wynaad and this specimen is still in the British Museum.

This completes our knowledge of the Button-quail in the Presidency and nothing definite seems to be on record as regards the breeding season or the status of the species.

Hypotaenidia striata gularis (Horsfield).

Rallus gularis Horsfield, Trans. Linn. Soc., xiii (1821), p. 196—Java.

Not obtained by the Survey. The Blue-breasted Banded Rail is probably a resident species in the Presidency though very little is really known about it.

The late Mr. J. Darling found a nest with 5 eggs in a small swamp at Sultan's Battery, Wynaad, 2,000 ft., on 26 August and in addition found the hatched shells of three other nests. William Davison mentions examining fragments of a skin obtained by Darling in the Wynaad, and it was either these fragments or a female in the British Museum obtained by Darling at Vythery, Wynaad, on 26 August 1874 that was doubtless connected with the identification of the above nest (Hume and Marshall, ii, 249; *S.F.*, x, 415). A female from Kotagherry (15 March 1875 Miss Cockburn) is also in the British Museum.

Cardew records it from Cannanore (*Birds of S. India*, p. 325) and Terry obtained a female (now in Dr. C. B. Ticehurst's collection) on 4 April at Pulungi in the Palnis. A banded rail observed by Captain Bates on April 29 on the downs outside Kodaikanal at 6,500 ft. may have been of this species.

In Travancore, according to Ferguson, this rail may be found scattered about in marshy thickets near the coast. A pair in the Hume collection from the 'west coast of Madras' may perhaps be Travancore birds.

There is no very definite evidence as to the occurrence of this rail on the eastern side of the Presidency. Hume received two specimens from Captain Mitchell *said* to have been procured in the Madras market but the italics suggest that Hume suspected some mistake in the matter.

Specimens of this rail from N.-E. and S.-W. India appear to me to belong to the same form and to be larger and with less black on the upper parts than specimens of the typical race from the Philippines. These Indian birds are attributed by Stuart Baker to *gularis* (Java) but by Chasen (*Handlist of Malaysian Birds*, p. 24) to a separable larger race *Rallus albiventris* Swainson Animals and Menag. (December 1837), p. 337—India. The difficulty is that there is no proper series available to furnish the measurements of Javan topotypes, which agree with Indian birds in colour. As the type of *gularis* in the British Museum has a wing of 117 mm. and two birds (♂♂) from Ceylon have wings (118, 120.5 mm.) I propose to follow Stuart Baker in uniting Indian birds with the Javan form, until such time as a Javan series is available to establish otherwise.

[**Porzana porzana** (Linnaeus).

Rallus porzana Linnaeus, Syst. Nat., ed. xii (1766), vol. i, p. 262—France.

Jerdon states that the Spotted Crake is found over all India and in particular reference to a Rail obtained in a swamp in the Nilgiris which he believed to belong to this form (*Madras Journ. Lit. Sci.*, 1844, p. 174). There is a specimen labelled Madras in the Madras Museum. As however there does not appear to be any particular history to this specimen and as the species is not otherwise recorded from nearer than Belgaum, I think it better not to admit this species to a full place on the Presidency list.]

Porzana pusilla pusilla (Pallas).

Rallus pusillus Pallas, Reise Russ. Reichs., vol. iii (1776), p. 700—Dauria.

Baillon's Crake has only been recorded from the western side of the Presidency, and there apparently only on three occasions. Hume says (*S.F.*, x, 415) that he had received one from the Wynaad though the specimen is no longer in the Hume collection.

Ferguson states that he received a single specimen in Travancore, brought to him alive in December. He adds that it had evidently bred there as there was a young one with it, but this was I presume only hearsay and is hardly likely to have been correct. A female collected at Charki, Trivandrum (Bourdillon) on 18-11-1878 is in the British Museum.

In the *New Fauna* (vi, p. 15) the nest is said to be very hard to find as the bird always creeps quietly away from it. In *Nidification* (iv, 295) it is stated that the nest is not hard to find as the bird generally flies direct from it.

Rallus eurizonoides amuroptera (Jerdon).

Porzana amuroptera Jerdon ex Blyth, MSS. Birds of India, vol. iii (1864), p. 725—Orissa.

Very little is known about the Banded Crake in the Presidency and it was not procured by the Survey. On the eastern side it is only recorded from Gumsur in Ganjam, whence Blyth obtained it (*Catalogue Birds. Mus. As. Society,* p. 285), and Madras from which neighbourhood the Madras Museum obtained a single specimen (Hume and Marshall, ii, 238).

On the west a male was collected by Captain Gosse on 28 June 1918 on the Rookey Estate, Kil Kotakiri 4,300 ft. This bird was shot in a swamp in the bottom of a deep valley near the factory and is now in the British Museum.

It occurs in Travancore. Hume obtained a specimen from the Assambo Hills (*loc. cit*). A specimen marked 'Mynall' with no other data is in the Hume collection, and Ferguson states that he procured one in 1875 in some paddy fields near the foot of the hills in S. Travancore at about 400 ft. I am not quite clear how many different specimens these three records refer to or whether they all actually refer to the same bird. There is however another Travancore specimen in the British Museum, without proper data, collected by Fry.

Finally in the *Journal* (xii, 216) Mr. W. N. Fleming records a specimen caught at Tuticorin on 14 November 1896, exhausted after a cyclone from the N.-E., a record which recalls Hume's account of the arrival of this species on the coast of Ceylon.

The name *nigrolineatus* Hodgson in Gray's Misc. 1844, p. 86, finally adopted for the Indian bird by Mr. Stuart Baker, *Nidification*, iv, 295, cannot be used as it is a *nomen nudum* and quoted as a synonym of *Rallus superciliaris* Eyton (vide Peters, 1934, p. 172). The next name available is *Porzana amuroptera* Jerdon ex Blyth, MSS. *Birds of India,* vol. iii, 1864, p. 725. The type locality is Orissa, vide *Ibis* 1867, p. 310.

I have provisionally accepted Mr. Stuart Baker's identification of South Indian birds with those found in Northern India, though the birds that I have measured from Ceyon and S. India appear to be somewhat smaller. So few of the specimens available are, however, reliably sexed that, in view of the difference in size of the sexes in rails, I have hesitated to accept a southern race until better material is available.

Amaurornis fuscus fuscus (Linnaeus).

Rallus fuscus Linnaeus, Syst. Nat., ed. xii, vol. i (1766), p. 262—Philippine Islands.

Not procured by the Survey. The Ruddy Crake has hitherto only been recorded from the western side in the Presidency, from the Wynaad and Travancore. Of the former William Davison remarks that he only saw and obtained two males on 2 May at Karote in some rice fields. There are however three specimens in the British Museum collected by him at Karote, namely two males shot on 12 May 1881 (so 2 May is doubtless a misprint) and a female shot on 16 May 1881.

As regards Travancore Ferguson considered the Ruddy Crake fairly common. In his time the Trivandrum Museum contained 6 specimens namely an Anjango skin, two from an old collection labelled Travancore and three taken at Kuttyani near Trivandrum in April. A Bourdillon specimen with no precise data is in the British Museum. In *Nidification* (iv, 300) Stewart is said to have once taken the nest in Travancore but no details are given.

Mr. Stuart Baker [*Bull. B.O.C.*, vol. xlvii (1927), p. 73] has separated Cinghalese and S. Indian birds from the typical race (Philippines) as *Amaurornis fuscus zeylonicus*, as being much paler and faintly tinged with yellowish olive above. There appears to be no real difference in size and the supposed colour difference I have failed to recognise. Under the circumstances therefore I keep these southern birds with the typical race. They are of course smaller (wing 90.5-98.5 mm.) than N. Indian birds *A. f. bakeri* (wing 100.5-109.1 mm.) which are again slightly smaller than *A. f. erythrothorax* of Japan (wing 111.5-118 mm.).

Amaurornis phoenicurus phoenicurus (Pennant).

Gallinula phoenicurus Pennant, Ind. Zool. 1769, p. 10, pl. ix—Ceylon.

Not procured by the Survey. In the Presidency the White-breasted Waterhen is best known on the western side. It is presumably a resident species.

In Coorg it is evidently not common for Betts calls it a shy and solitary bird which may occasionally be flushed. William Davison says that it is rare on the Nilgiris and their slopes but not uncommon at the base of the hills through the Wynaad. He did however procure it in the Botanical Gardens at Ootacamund. Colonel Sparrow's collection contains a specimen killed at Kolletur, Malappuram, on 13 December 1912.

In Travancore, according to Ferguson, it is found throughout the low country round the edges of paddy fields.

On the eastern side the sole authority for its occurrence is Dewar's remark that it is rare at Madras.

Ferguson gives the breeding season in Travancore as April.

In the *Ibis* 1924, pp. 509-10, Ticehurst gives his considered opinion that birds from India and Ceylon are inseparable, the variation in size and the colour of the under tail-coverts being individual. With this opinion, I agree, having arrived at it independently on the examination of fresh material not seen by Ticehurst.

Gallinula chloropus indicus Blyth.

Gallinula chloropus ? var. *indicus* Blyth, J.A.S.B., vol. xi (1842), p. 887—India, Nellore.

Not procured by the Survey. The Waterhen is far rarer in Southern India than in the north and there are practically no records for the Presidency. I have examined no local specimens but assume that they are not likely to be different to those of India generally. Status unknown.

William Davison says that he has often seen the Waterhen in the Wynaad and that it is common on the lake at Ootacamund, breeding in the sedges of the margin. This latter statement was doubtless correct at the time but as

Col. H. R. Baker points out (*Birds of S. India*, p. 332) the lower portion of the lake was reclaimed many years ago and the Waterhen has disappeared in consequence.

Ferguson states that it is by no means common in Travancore, there being only one specimen in the local museum.

On the eastern side this species is only recorded from Madras where Dewar calls it rare, his record being probably based on the local specimen in the Madras Museum.

Jerdon was at Nellore when he sent the type specimen to Blyth.

Gallicrex cinerea (Gmelin).

Fulica cinerea Gmelin, Syst. Nat., vol. i, pt. ii (1789), p. 702—China.

Not procured by the Survey. There is as yet very little information about the distribution of the water-cock in the Presidency and it is probably more common than is at present realised.

Dewar calls it rare at Madras but its occurrence is substantiated by a local specimen in the Museum. On the west Major Phythian Adams informs me that it is common about Cannanore. In Travancore, according to Ferguson, it is not uncommon in and about the rice cultivation of the low country. Two 'Anjango' females are in the British Museum.

Nothing is known about the breeding season in the Presidency though the bird is presumably a resident.

When a proper series is available the racial identity of South Indian and Chinese birds will require checking.

Porphyrio poliocephalus poliocephalus (Latham).

Gallinula poliocephala Latham, Suppl. Index. Orn. (1801), p. 68—India.

So far the Purple Coot has only been recorded from two areas in the Presidency, the neighbourhood of Madras and in Travancore. At Madras according to Dewar the Purple Coot is fairly common.

In Travancore Ferguson states that it is common in all the larger lakes wherever there are reeds and rushes, and this information is amplified by Bourdillon's statement (*S.F.*, vii, 39) that the bird is found in great numbers in the reed-beds of the Vellarney Lake, though for some reason (possibly the increase of vegetation) it appeared scarcer in June than in March.

Ferguson gives the local breeding season as July and August.

No specimens were procured by the Survey and I have seen none from anywhere in the Presidency. As however Ceylon birds appear to me to be identical with those from North-West India there can be little doubt that Presidency birds belong to the typical race.

Latham's name was based on a drawing by General Davies of a bird in the Exeter Exchange.

Fulica atra atra Linnaeus.

Fulica atra Linnaeus, Syst. Nat., ed. x, vol. i (1758), p. 152—Sweden.

The coot was not reported by the Survey and it appears to be scarce in the Presidency, though Howard Campbell found it breeding in the Cuddapah district (*J.B.N.H.S.*, xiv, 392). In 1892 he found a nest with 3 hard-set eggs on 30th September in a small tank near the town of Cuddapah. On 30 October of the same year he found several nests with fresh eggs in a small reedy tank at Occhaveli. He considered that the coot was probably double-brooded as a brood of young were seen following their parents on a tank early in April.

Finn includes the species in his Madras list, probably on the strength of a local bird which is in the Museum.

I have examined no specimen killed in the Presidency but have no reason to think that Presidency birds do not belong to the typical race, like all other Indian specimens.

Metopidius indicus (Latham).

Parra indica Latham, Index. Orn., vol. ii (1790), p. 765—India, Bengal.

Not procured by the Survey. Very little has been recorded about the Bronze-winged Jacana in the Presidency. As regards the west a specimen from Coorg is in the Tweedale collection in the British Museum. William Davison states (*S.F.*, x, 415) that Mr. T. Darling of the Rasselas estate near Manantoddy, Wynaad, procured a specimen. In Travancore, according to Ferguson, this Jacana is to be met with in suitable localities throughout the country. A male from the Vellarney Lake (5-2-1879 Bourdillon) is in the British Museum as well as a Fry specimen, and four 'Madras' specimens from Rev. H. H. Baker.

Dr. Gravely informs me that a local specimen is in the Madras Museum.

Bourdillon obtained eggs in Travancore in August, vide Stuart Baker, *Nidification*, iv, 321.

This species apparently has no races.

Hydrophasianus chirurgus (Scopoli).

Tringa chirurgus Scopoli, Del. Flor. et Faun. Insubr., vol. ii (1786), p. 92—[New Guinea] Luzon, Philippines.

The Pheasant-tailed Jacana was not procured by the Survey and we have even less information about its status in the Presidency. It evidently occurs at Madras for there is a local specimen in the Madras Museum and there are two Madras skins (one undated; one 1876, both Wardlaw-Ramsay) in the British Museum.

Ferguson says that flocks are common in the tanks of South Travancore, especially about Nagercoil.

This species apparently has no races.

Rostratula benghalensis benghalensis (Linnaeus).

Rallus benghalensis Linnaeus, Syst. Nat., ed. x (1758), vol. i, p. 153—Asia, Bengal.

Not procured by the Survey. The Painted Snipe is, I presume, very generally distributed in suitable places throughout the Presidency and no doubt many sportsmen can supplement the following details which I am about to enumerate. On the eastern side it is recorded from Jeypore (Ball). Mr. R. F. Stoney kindly informs me that they are fairly common both at Nellore and in Chingleput district and Dewar includes it in his Madras list. A local specimen is in the Madras Museum.

An interesting note by A. Theobald will be found in Hume and Marshall (vol. ii, p. 383). He says 'I have seen and shot this bird almost all over Southern India south of the 12° North Latitude. In the dry districts it comes in during the cold weather and remains till all the swamps and fields are dry but in well watered portions, like Tinnevelly, Tanjore, Malabar and parts of Coimbatore I have shot them throughout the year. I have never found the nest, but heard of one being taken near Erode. They are common in the inland districts but rare towards Madras, where they are caught in large numbers [sic] for the sake of their skins which are imported to China. [This trade we may now hope has been put an end to.] The bird fetches from two to four annas each in the Madras market, while the preserved skins are sold at from eight annas to one rupee. They are snared with horse-hair nooses by the Madras fowlers.'

In Travancore Ferguson considered it fairly common throughout the low country wherever there are reedy marshes. He also often flushed it from paddy fields. Three specimens from the Vellarney Lake (Fry) are in the British Museum. In this state Stuart Baker (*Game Birds*, ii, 124) considers it to breed up to 3,000 ft. In Cannanore it is evidently fairly plentiful as Captain Wall killed 32 in December, January and February of the shooting season 1903-4 (*J.B.N.H.S.*, xv, 722). From here it extends sufficiently up into the hills to reach the Wynaad, whence William Davison records it. Whether it may be included in the Nilgiri list is doubtful.

The Painted Snipe is in the main doubtless a resident species in the Presidency but it must move about locally in accordance with the distribution of the water supply and there may be also more definitely migratory movements, as in Ceylon it is apparently an immigrant about October.

Our information about the breeding season in the Presidency is far from complete. In Travancore Ferguson received eggs in December and young in

February. At Coimbatore Captain Packard found a shelled egg in a bird sent to the table in October (*J.B.N.H.S.*, xv, 139) and further north a Mr. Hadfield found an oviduct egg in January (*S.F.*, x, 414). This evidence suggests that a sufficient number of Painted Snipe breed in the cold weather to justify one in asking sportsmen to spare what is at best a most indifferent game bird.

There is no difference between birds from North and South India.

[**Grus grus lilfordi** Sharpe.

Grus lilfordi Sharpe, Cat. Birds Brit. Mus., vol. xxiii (1894), p. 252—R. Jhelum near Jelalpur, Punjab.

In Hume and Marshall, iii, p. 21, Major Campbell of the 26th M. N. I. writes from Quilon that the Common Crane is not uncommon in Travancore, but this statement has never been confirmed and is on the face of it unlikely.

When describing this species Sharpe neither designated a type nor a type locality. He described an adult male, and as only two such were in the British Museum collection and both from the Punjab, one must be the type, and we have selected the first which came from River Jhelum, near Jelalpur.]

Antigone antigone antigone (Linnaeus).

Ardea antigone Linnaeus, Syst. Nat., ed. x, vol. i (1758), p. 142—East Indies.

I have no knowledge regarding the occurrence of the Sarus Crane in the Presidency beyond Hume's statement (*Game Birds*, iii, p. 1) that it occurs in the Madras Presidency north of the Godavery and perhaps between the Kistna and the Godavery. It was not reported by the Survey.

Anthropoides virgo (Linnaeus).

Ardea virgo Linnaeus, Syst. Nat., ed. x, vol. i (1758), p. 141—Numidia.[1]

The only record of the Demoiselle Crane in the Presidency will be found in Hume and Marshall (iii, 31-38) where Albert Theobald is said to have seen it in the neighbourhood of Kollegal in the north of Coimbatore district and to have had reports of it from as far south as Tinnevelly. About Kollegal Mr. Theobald states that they appear in the latter part of December viz. about harvest time and leave by the end of February or early in March. In that neighbourhood in his time a certain measure of sanctity was attached to the bird.

Choriotis nigriceps (Vigors).

Otis nigriceps Vigors, P.Z.S. 1830-31 (2 March 1831), p. 35—Himalayas.[2]

According to Jerdon the Great Indian Bustard is—or was—found in the Carnatic and there is a specimen in the Madras Museum which is said to have been killed locally. Another specimen, in the Museum of St. Joseph's College, Trichinopoly, was killed by native fowlers at Samajapuram, 10 miles north of Trichinopoly on 25 February 1924. This was a full grown male (Father Leigh, *J.B.N.H.S.*, xxx, 225). In this area they must have been fairly common at one time as Major Charles A. Tostems (*S.F.*, x, 167) records that he shot one three miles west of Arupacottah, a large village in the Madura district on the Tinnevelly border. It was one of a party of seven or eight and he says that he had repeatedly seen eight or ten of a morning near the same place. Writing as if they were well known birds he adds:—the Bustard came to these plains (in Tinnevelly and Madura) about September and October. The same writer goes on to say that to the north of the Carnatic these Bustard are often to be had in the cold weather in the Kurnool district.

A successful stalk at Tugalli in Kurnool when three birds were secured from a party of six in January 1896 is described by Major R. W. Burton in Stuart Baker's *Game Birds*, vol. ii, p. 179.

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[1] For type locality see Grant, *Bull. B.O.C.*, lv, No. ccclxxxii (January 1935), p. 65.

[2] See *Ibis* 1924, p. 470, for a discussion of this type locality.

As this wonderful bird is, I fear, doomed to extinction before long, one can only hope that all sportsmen who have met with it or shot it in the past will record their experiences in some detail in the *Journal*. The historian of the Great Bustard in England deplores the paucity of his material and would give anything for the information which numbers could have recorded had they realised the birds' approaching doom.

Sypheotides indica (Miller).

Otis indica Miller, Icones Anim. (1782), p. 6, pl. 33—India Orientali.

Not procured by the Survey. I have been able to trace a fair number of records of the Likh in the Madras Presidency though these, no doubt, do not give a full picture of its status and distribution. Jerdon says it is found in the Northern Circars and Stephen Cox (*J.B.N.H.S.*, xii, 575) saw one shot at Razan in Waltair District. There are fuller records for Cocanada and Rajahmundri. Near the former place Major Charles MacInroy says that he has known four or five killed in a morning at Samulcottah, a deserted cantonment (*N. & E.*, viii, 492). Major Charles A. Tostems (*S.F.*, x, 168) says that he had shot 3 or 4 of a morning in December and January at Rajahmundri—Cox also knew of it being shot in the Godavery district—and mentions as very unusual the capture of a female in June by a native shikari. Further south at Ongole in Nellore district he considered the bird common.

In the Carnatic generally Jerdon considered the Likh chiefly a winter visitor. About Madras Dewar called it not at all common, quoting a Mr. Cross who though shooting regularly rarely killed more than a single bird a year. There is a local specimen in the Madras Museum, and four specimens labelled Madras with no definite data are in the Wardlaw-Ramsay and Hume collections in the British Museum. Further south Jerdon states that he had found the nest in October near Trichinopoly.

The western side is not very suitable to its requirements but a single specimen was killed on the slopes of the Nilgiris some years before 1887 between Neddivattum and Pykara (Hume, *S.F.*, x, 412).

In Travancore Ferguson only knew of a single record, a bird shot in some rushes near Trivandrum in 1876.

Burhinus oedicnemus indicus (Salvadori).

Œdicnemus indicus Salvadori, Atti Soc. Ital. Sc. Nat., vol. vii (1866), p. 381—India.

Specimens collected:—117 ♀ 23-4-29 Kurumbapatti; 453 ♂ 20-6-29 Tirthamalai 1,000 ft.

Measurements:—

	Bill.	Wing.	Tail.	Tarsus.
1 ♂	42.5	203	109	73.5 mm.
1 ♀	40	203	103	74.5 mm.

There are a few records of the Stone-Curlew on both sides of the Presidency. On the east Rhodes Morgan shot a female in May in Kurnool and found a coloured egg in the oviduct as described in *N. & E.*, iii, 333. A specimen from Singaperumal Koil, Chingleput district, is in the Madras Museum. The two Survey specimens complete the records on this side. No. 117 contained an egg almost ready to lay.

On the west William Davison collected a female at Segore on 18 February 1881 which is now in the British Museum and Major Phythian Adams informs me that he took c/2 eggs, almost fresh, near Kollegal in N. Coimbatore on 21 July 1935.

As regards Travancore Ferguson says:—I have on more than one occasion seen and shot this bird when snipe-shooting at Valey, 4 miles from Trivandrum, where the soil is sandy and the place is clothed with shrubs and cocoanut trees. They were sometimes in small parties of three or four; at other times solitary. Breeds here in August.

Esacus recurvirostris Cuvier.

Œdicnemus recurvirostris Cuvier, Règne Anim., 2nd ed., vol. i (1829), p. 500—India.

Not procured by the Survey. While the Great Stone Plover probably occurs on all the suitable rivers of the Presidency I have only actual record of its occurrence in three localities. Mr. H. C. Smith, I.F.S., kindly informs me that he found a newly hatched chick at Masulipatam on 16 April 1918. Mr. H. R. S. Hasted saw at least 12 old birds and found a chick on the Kistna River in Kurnool. The date is given as 29 June 1909 but there may be some mistake as Mr. Hasted was apparently out snipe-shooting (*J.B.N.H.S.*, xx, 221). There is a local specimen in the Madras Museum. The bird is doubtless a resident as in other parts of its range.

Cursorius coromandelicus coromandelicus (Gmelin).

Charadrius coromandelicus Gmelin, Syst. Nat., vol. i, pt. ii (1789), p. 692—Coromandel Coast.

Not procured by the Survey. The Indian Courser is only recorded as occurring in two areas in the Presidency. The first is near Madras as there is a local specimen in the Government Museum and three specimens from Madras—apparently meaning the capital—are in the Hume and Wardlaw-Ramsay collections.

In Travancore Ferguson says his collector shot two in June 1902 in some sandy plains 8 miles south of Quilon. Four more were subsequently obtained 12 miles south of Quilon and as these included a very young bird Ferguson concluded that the species must breed in this area. He was doubtless right as Stuart Baker (*Nidification*, iv, 345) says, on the authority of Stewart, that this Courser is common in the deforested areas of Travancore, breeding from May to July.

The scientific name is given trinomially as in my opinion *Cursorius temminckii* Swainson, 1822 is merely an African race of the Indian Courser.

Rhinoptilus bitorquatus (Blyth).

Macrotarsius bitorquatus Blyth, J.A.S.B., vol. xvii (1), 1848, p. 254—Eastern Ghats.

'This remarkable Plover has hitherto, I believe, only been procured by myself,' said Jerdon in his *Birds of India,* 'from the hilly country above the Eastern Ghats, off Nellore and in Cuddapah.' He appears to have left no further record of the exact locality, the date or the number of birds seen, though he gave a few details of behaviour and the bird was not reported again until Blanford saw three in open forest 15 miles east of Sironcha (*Ibis* 1867, p. 462 and *J.A.S.B.*, 1869, p. 190). Later Blanford obtained two males on the 5th and 9th March 1871 near Badrachalam north of the Godavery. These two specimens are in the British Museum. Since then an anonymous writer in the 'Asian' is said to have found the eggs and Howard Campbell is said to have procured a male near Anantapur (*New Fauna,* vi, p. 88) but these original references I have failed to trace.

The above is a brief epitome of all that is known about the occurrence and distribution of Jerdon's Courser not only in the Presidency but in the whole of India and the rarity and limited range of this Indian member of an African genus make it one of the most interesting birds on the Presidency list. Mr. LaPersonne in this Survey and Mr. Salim A. Ali in the Hyderabad Survey (*J.B.N.H.S.*, xxxvii, 443) made special efforts to find the bird again but without success.

[**Glareola pratincola maldivarum** Forster.

Glareola (*Pratincola*) *maldivarum* Forster, Fauna Indica (1795), p. 11—Maldive Islands.

Baker and Inglis include the Large Indian Pratincole in their account of the Birds of South India, no doubt on account of the fact that it breeds in small colonies in Ceylon. There is, however, so far as I am aware, no record of its occurrence in the Presidency.]

Glareola lactea Temminck.

Glareola lactea Temminck, Man. d'Orn., 2nd ed., vol. ii (1820), p. 503—Bengal.

Specimens collected:—1275 ♂ 20-1-30, 1285-1288 ♀ ♀ ♂ ♀ 21-1-30, 1290 ♀ 22-1-30, 1291 ♀ 1298 ♀ 23-1-30 Godavery Delta.

Measurements:—

	Bill.	Wing.	Tail.	Tarsus.
2 ♂	15	156.5-160.5	56-58.5	22-22.5 mm.
6 ♀	14.5-15.5	143-156.5	50.5-58.5	22-22.5 mm.

The Little Indian Pratincole was only obtained by the Survey in the Godavery Delta in January. Here they appeared about sunset in flocks of 30 or 40 birds which flew about over the tree tops of the island, where the Survey was encamped, feeding in the air and descending after sunset to skim over the surface of the water. The females had their ovaries slightly enlarged.

It had been previously recorded in the west of the Presidency. Ferguson says that he only received it from North Travancore where flocks consisting of a dozen or more were met by his collectors at Velyani near Alwaye, frequenting the open flats on either side of the Alwaye River up to Malayaltur.

Sir A. Cardew found it breeding on the sandy banks of a river at Mangalore in April.

There is no difference between birds from North and South India.

Dromas ardeola Paykull.

Dromas ardeola Paykull, K. Vet.-Ak. Nya Handl., vol. xxvi (3), 1805, p. 182—India.

The only information which I can find about the distribution of the Crab-Plover in the Presidency is Jerdon's statement that he found it on the east coast near Nellore, far from rare at the mouths of rivers and along backwaters. It was in small flocks and observed 'during the hot weather, as well as at other times'. A specimen in the Madras Museum is said to have been obtained locally. As it is fairly common on the north coasts of Ceylon it is doubtless also to be found on other parts of the Presidency coast.

(*To be continued*).

A NEW RACE OF HORSFIELD'S SCIMITAR-BABBLER.

BY

H. WHISTLER, F.Z.S., M.B.O.U.

In the Eastern Ghats Survey (*J.B.N.H.S.*, xxxv, 742) I discussed the difficulties inherent in a study of the races of Horsfield's Scimitar-Babbler (*Pomatorhinus horsfieldii*) and pointed out that birds obtained from the Lower Eastern Ghats (Kurumbapatti, Shevaroy Hills, Palkonda Hills, Nallamalais) differed from those of the rest of India in having short beaks (29-31·5 mm.) and in lacking the black edge to the white plastron. At the time however I was loath to add to the races of this species on the material before me. In the Hyderabad Survey (*J.B.N.H.S.*, xxxvi, 375) I returned to the subject, pointing out that the three specimens obtained by Mr. Salim Ali at Ferahabad 2,800 ft. on the Amrabad Plateau, which is physically little but a continuation of the Nallamalais, agree with the series from further south. I suggested then that this south-eastern race appeared worthy of a name as its characteristics though slight in character appeared to be correlated with a sharply defined distribution.

Since the above was written I have examined a fine series of Horsfield's Scimitar-Babbler collected by the interest of Mr. R. C. Morris in the Billigirirangan Hills. These birds are all long-billed (30-33 mm.) and have a marked black edge to the plastron and evidently belong to the typical race, being sharply defined from *P. h. travancoreensis* of the western coast and the birds under consideration from the Eastern Ghats. As this fact emphasises the definition of the characteristics and range of the Scimitar-Babbler of the South-Eastern Ghats, I now desire to give the latter a name and propose to call it

POMATORHINUS HORSFIELDII MADERASPATENSIS subsp. nov.

Type: Vernay Survey No. 122 ♂ 24 April 1929 Kurumbapatti, Salem District (now in the British Museum).

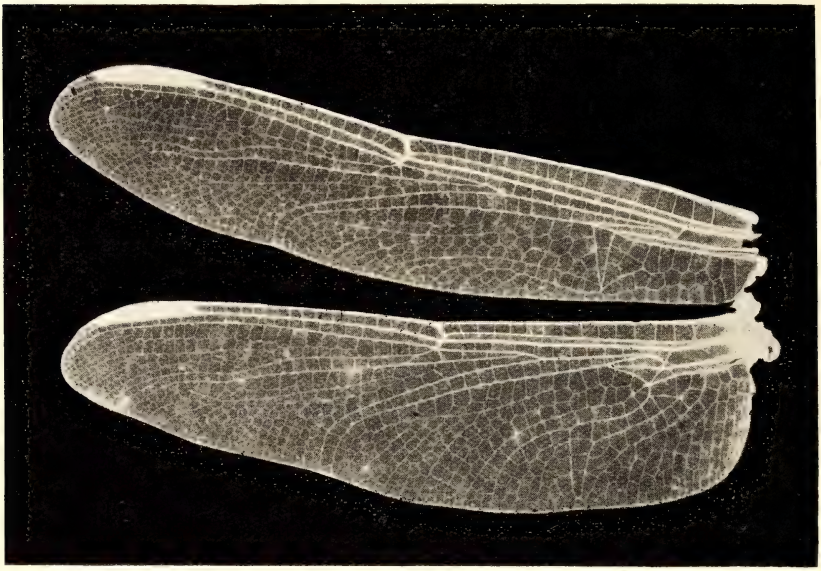
NEW ORIENTAL DRAGONFLIES.

BY

F. C. FRASER, *Lt.-Col.*, I.M.S. (Retd.), F.R.E.S.

(*With a text-figure*).

Dr. F. F. Laidlaw has passed on to me three species of dragonflies for description, two of which are new to science and the third, the hitherto undescribed female of *Idionyx dohrni* Kruger.



Wings of *Protorthemis intermedia* sp. nov.

Male. Abdomen 33 mm. Hindwing 42 mm.

Head: labium and anteclypeus ferruginous; labrum, rest of face and frons dark reddish-brown; occiput almost black. Prothorax and synthorax reddish-brown changing to blackish-brown on middorsum. Wings hyaline; antenodal portion of costa of forewing distinctly longer than the portion from node to apex (this portion decidedly shorter in all other species); subtrigone of forewing made up of 5 cells; hypertrigones traversed once or twice; discoidal cell of forewing 3-celled, traversed once in the hindwing; discoidal field forewing beginning with a row of 4 cells and then continued for a short distance as rows of 3 cells; supplementary nervures present in Bridge; anal loop extending 4 cells beyond distal end of discoidal cell. Membrane dark-brown. Legs reddish, distal ends of femora and tibiae and tarsi black. Anal appendages simple, finely denticulate beneath, reddish-brown. Genitalia closely similar to those of *P. celebensis*.

Habitat: Palawan. A single male only, which will be deposited in the British Museum as the type. The relative lengths of the antenodal and postnodal portions of the forewing will serve to distinguish this species from all others of the genus.

Idionyx dohrni Kruger.

Female: Abdomen 30 mm. Hindwing 31 mm.

The female has not been described: it resembles the male very closely in colour and markings. The vesicle is not specialized but is rather flattened and rounded at the apex. Wings hyaline, uncoloured; anal-loop 9-celled; only one row of cells between the origins of *Cuii* and *IA* in the hindwing; 14-15 antenodal nervures in forewing, 7 postnodal; 8-10 antenodal and 8 postnodal nervures in hindwing.

Habitat: Perak, F.M.S., Jor Camp, 2,000 ft., coll. 3. Seimund, 22, viii, 22. The female of this species closely resembles that of *I. imbricata* but the wings are uncoloured at the base and the anal-loop is shorter.

Idionyx laidlawi sp. nov.

Female. Abdomen 31 mm. Hindwing 34 mm.

Head: labium, labrum and rest of face including the lower part of frons dark ochreous; upper part of frons and the vesicle metallic blue; the latter conical, rising steeply, its apex tapered finely and bearing a small horse-shoe ridge at its summit which encloses a tiny notch behind, whilst below it, on the posterior aspect of the vesicle, there is a small but stout spine. Occiput black. Prothorax and thorax metallic blue marked with short antehumeral yellow stripes extending only halfway up the dorsum, and with two oblique citron yellow stripes on each side, one medial, the other bordering the metepimeron posteriorly. Beneath yellow, marked with three large oval submetallic dark spots. Wings hyaline, uncoloured; pterostigma black; membrane pure white; anal-loop made up of 10 cells; 2 cubital nervures in hindwings; only a single row of cells between the origins of *Cuii* and *IA* in the hindwing; 13 antenodal and 7-8 postnodal nervures in forewing, 9 antenodal and 10-11 postnodal nervures in hindwing. Abdomen black, unmarked, segments 8 to 10 slightly dilated and depressed; vulvar scale triangular, projecting conspicuously in profile. Legs black but the two hinder pairs of tibiae bright yellow on the flexor surface. Male unknown.

Habitat: Pahang, Malay Peninsula. A single female, the type, from Fraser's Hill, 4,200 ft., 3-6-21, collected H. M. Pendlebury. This species is easily determined by the highly specialized shape of its vesicle which approaches that of *I. intricata* Fras., but has a posterior spine which is absent in the latter. It appears to be closely related to this species and belongs, with it, to the *optata* group. The type will be placed in the British Museum.

FRESHWATER FISH AND FISHERIES OF TRAVANCORE.

BY

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(Department of Zoology, Agra College, Agra).

(With 5 text-figures).

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INTRODUCTION.

The materials for this paper were obtained during the years 1932 and 1933 when I had the opportunity of spending some months in Travancore. To get a fairly accurate idea of the seasonal distribution of the various types of fish, it was necessary to make collections during different seasons. Accordingly the first collection was made three weeks before the commencement of the South-West Monsoon and another, two weeks after the commencement of the rains. The third collection was made during October and November. The first and second collections were made personally by me both in the hilly regions and the plains, but for the October and November collections, I depended mostly on the help rendered by friends in different parts of the country. As already stated, these three collections were planned with the object of obtaining a more or less general idea of the seasonal distribution of the freshwater fishes. The first collection is I believe fairly representative of summer conditions, when in the plains, rivers and canals are stagnant and at their lowest levels and streams in the hills are partly dry and broken up into puddles and pools, connected only by narrow and irregular channels. The second collection gives some idea of the fish obtainable during the rainy season, while the third represents the condition of the fisheries during the cold season. The author is fully aware of the fact that three hurried collections by themselves are not sufficient to give a perfectly accurate idea of the seasonal distribution of fish, even of a very narrow tract of country, but it is hoped that this work will more or less form a preliminary account, which may stimulate other workers permanently settled in the country to make a more comprehensive and thorough study of the subject.

Judging from the list of vernacular names of fishes supplied by local residents in different parts of the State I presume that there is still a large number of species unrecorded. For instance in Thodupuzha (one of the Taluks of the State), I was informed that the type commonly called '*Vakameen*' (one of the *Ophiocephalidae*) is represented by at least two distinct varieties, which I had not succeeded in getting. Their vernacular names were *Arivaka* and *Pandavaka*. In other places people gave me names of fish, such as *Katti*, *Kathi*, *Kuilkathi*, *Chekada*, *Kadimeen*, *Vazutha*, *Kooral*, *Chenkanian* and *Vellivala*, which I have not been able to correlate with the specimens I had collected, and, by way of explanation, I was informed that these varieties were not available during the particular season when I visited those places. It is impossible, with the present state of our knowledge, to say whether these names are synonymous with other names which I have recorded or whether they are really types which I did not succeed in getting, owing either to their rarity or absence during certain seasons.

One great difficulty in the way of arriving at any positive conclusion in this matter is the fact that the same fish is known by different vernacular names in different localities. The vernacular names of fishes in South Travancore have been compiled by Shankeranarayana Pillay (1929) and these names resemble the Tamil names. In the northern parts of the State, the same fishes are known by different names. As these parts of the country are completely isolated from Tamil influence, the names prevalent here may be safely regarded as the Malayalam names. Even in these northern parts, the name of the same fish changes from place to place. For example, according to Shankeranarayana Pillay, *Mastacembelus guentheri* is known as *Kal-aural* in South Travancore. The same fish is called *Arakan* in places round about the little market town of Changanacherry, while it is called *Pazhukkamundi* in the hilly regions of Moovattupuzha and Thodupuzha taluks. The variable and indefinite nature of these vernacular names prevailing within narrow limits shows how great are the difficulties which confront the worker who attempts to discover vernacular names of even the commonest food fishes of the country.

A fairly representative collection of fishes were brought to Madras for purposes of identification and they are now preserved at the Madras Government Museum.

In conclusion I wish to record my deep sense of gratitude to Dr. F. H. Gravely, Superintendent of the Madras Government Museum, for kindly allowing me the use of collecting equipment and for permitting me to carry on the work of identification in the Zoology Department of the Museum. My thanks are also due to Mr. Chinnappiah, Zoological Assistant of the Government Museum, for his valuable help and suggestions during the progress of this work. However, soon after I began this work I was appointed to the Agra College and so I got through the identification in a hurry, using only Day's volumes on Fishes, in the *Fauna of British India series*. References giving more recent nomenclature are not available at Agra, hence it was not possible for me to make the systematic description more uptodate. It has already been pointed out to me that some of my identifications are open to doubt. I do not challenge such a criticism as I have no facilities to verify my observations, as I am far away from the place, where the material is available. However, in such a paper as this, though the systematic description is not the essential aim, it forms an indispensable part, since it is the only medium through which the habits and economic importance of the various types of fish can be adequately described, and that purpose will be achieved whatever the system of classification adopted.

GEOGRAPHY.

For the proper appreciation of the scope of fisheries in a country it is essential to have a general idea of its geographical features, as the possibilities of fisheries development can be gauged only from this aspect.

Travancore, a name derived from the Malayalam word, which means the 'abode of the Goddess of Prosperity', is a land which certainly justifies its name, being perhaps one of the most beautiful and fertile areas in the southern part of India. The great diversity of the physical aspects of the country, with its 'mountainous amphitheatre, sylvan slopes, sequestered glens, rich and variegated valleys embellished with foaming torrents', its flat coastal plains with extensive cocoanut plantations and waving expanses of paddy fields, presents a picture unique in the whole of India.

Travancore lies in the extreme south-west of Peninsular India between 8° 4′ and 10° 21′ N. and 76° 14′ and 77° 73′ E.; and derives great advantage from the fact that it is flanked by a continuous range of hills along its eastern boundary. The northern and eastern parts spread out in a plateau of considerable width. Towards the coast these ranges soften down into undulating slopes which finally melt into the narrow strip of flat fertile coastal plain. The total area of the State is 7,625 sq. miles, of which 5,778 sq. miles or nearly three-quarters, comprise the highlands and the rest, 1,847 sq. miles, forms the coastal plains.

The Western Ghats extend into the north-eastern part of Travancore and reach their highest elevation in the Anamudi peak. The numerous hills clustering round this part are collectively called the 'High Ranges'. South of this there is a chain of hills called Cardamom Hills. From this main chain of ranges, rocky spurs forming secondary ranges run out towards the west and in certain places reach the coast. These chains of ranges are separated by innumerable valleys enclosed within an ocean of forests, through which run streams, rivulets and rivers, roaring in a mad rush to reach the plains below.

The chief mountain ranges according to their vernacular names are Anamudi Hills, Agasthyakootam, Mahendragiri, Mottachimala, Pirmed, Ponmudi, Elamala and Sabirimala. As already stated, this chain of ranges collectively called Anamudi Hills and Cardamom Hills form a broad plateau, from the bosom of which a few rugged cliffs and spiry points break through the undulating contour and reach altitudes ranging from 4,000 to 8,000 ft. above sea level. These mountain ranges standing like a wall behind a narrow coastal plain covered with exuberant vegetation check the rain-bearing winds blowing directly against them from the Indian Ocean. This gives Travancore its greatest natural advantage. The rainfall is heavy. The South-West Monsoon, which brings the greatest quantity, falls between May and August. The North-East Monsoon commences at the end of October. The maximum annual rainfall is about 200 inches.

Owing to the mountainous character of the country and the heavy rainfall both during the summer and winter months, there are numerous rivers and streams all over the country. There are twelve main rivers and these in the order of succession from north to south are: (1) Periyar, (2) Moovattupuzha river, (3) Meenachil river, (4) Pambayar, (5) Kallada river, (6) Attungal or Vamana river, (7) Karamana river, (8) Killiyar, (9) Neiyar, (10) Thambravarni river, (11) Kothayar and (12) Vadacherry river. The northernmost river—the Periyar—is the longest and as we proceed southwards they become smaller and smaller and the southernmost one is only a small rivulet hardly about 25 miles long. The Periyar is 142 miles in length and rises in the Sivagiri forests about 60 miles from Devikulam at an elevation of 3,000 ft. About seven miles west of a place called Mullaperiyar the river runs through a narrow gorge steeped on both sides by high hills. The construction of a dam at this point has caused water to accumulate into a big freshwater lake, from which water is diverted to the adjoining British territory for irrigation purposes.

All the rivers generally have a winding course and they empty themselves either into the system of lakes described below or directly into the sea.

Along the coast, a chain of lakes extends from the borders of Cochin to Trivandrum. These lakes are extensive sheets of water into which one or more rivers flow. A few of these lakes are connected permanently with the sea, while others are separated from the sea by a bar of sand. The rivers which flow into these lakes deposit large quantities of alluvium and, as a result, the lakes are rather shallow and in certain parts, especially in the Vembanad lake, these shallows are enclosed by bunds and used for paddy cultivation. Proceeding northwards from Trivandrum, the lakes in their order of succession are: Velikayal, Katinamkulam, Anchuthengil Kayal, Nadayar, Paravur lake, Ashtamudi, Kayamkulam lake and Vembanad lake. Of these eight lakes, Vembanad, Kayamkulam and Ashtamudi lakes are important. The Vembanad lake is nearly thirty miles long and nearly ten miles across at its broadest part. Though the Ashtamudi lake is only ten miles long, it is one of the most beautiful lakes in India. Apart from its natural beauty, it affords important fisheries to the country and popular belief maintains that fishes found in certain parts of this lake are delicious.

In addition to the lakes mentioned above, in which the water is either saline or brackish, there are a few freshwater lakes, the three largest being, Vellani, near Trivandrum, Sasthankotta, in the Kunnathur taluk, near Quilon, and the Periyar lake. Thazakudi tank in Thovala taluk and Mekottu tank in Kalkulam taluk may also be brought under this category.

From the above account it will be seen that Travancore is ideally suited for developing both sea and freshwater fisheries. Nowhere in India is there another State or Province which is so well suited to the development of fisheries. The possession of a shallow coastal sea, which affords excellent fishing grounds for Sardine and Mackerel fishery, the presence of a beautiful chain of lakes and a system of deep and perennial rivers intersecting the country with a net-work of canals, combine to afford the best facilities for developing this source of revenue to the State and a substantial and steady income to the people.

LIST OF FRESHWATER FISHES AND THEIR LOCAL NAMES.

Serial No.	Scientific Name	Local Name
1	*Anguilla bicolor* ...	Valangil, Manangu (C.T.).
2	*A. vulgaris* ...	Kuruttu-vilangu (T.).
3	*Clarias magur* ...	Yeri-vahlay (T.).
4	*Saccobranchus fossilis* ...	Kaari (C.T.), Theyli (T.).
5	*Wallago attu* ...	Vahlah (C.T.).
6	*Callichrous bimaculatus* ...	Chotta-vahlah (C.T.).
7	*C. malabaricus* ...	Manja-vahlay (T.), Chotta-vahlah, Thamma (C.T.).
8	*Pseudotropius sykesii* ...	Naui-kelithi (T.).
9	*Macrones chryseus* ...	Manja-koori, Eatta-koorie (C.T.), Moongil (T.), Mungil yata (D.).
10	*M. gulio* ...	Vellah-koorie, Changan-koorie (C.T.), Kadel-kelithi (T.).
11	*M. oculatus* ...	Koorie (C.T.), Theydoo (T.).
12	*M. vittatus* ...	Chillan (C.T.), Kallen-koorie (T.)
13	*M. montanus* ...	Vari-kallan-koorie (T.).
14	*M. malabaricus* ...	Kallan-koorie (T.).
15	*Nemachilus botius* ...	Attu-meen (T.).
16	*N. triangularis* ...	Kal-kanni (T.).
17	*Homaloptera maculata* ...	......
18	*Discognathus jerdoni* ...	Koravai (T.).
19	*D. jerdoni* ...	Kal-nakki (T.).
20	*Labeo dussumieri* ...	Toolee (C.T. & D.).
21	*Amblypharyngodon mola* ...	Oolari (T.).
22	*A. microlepis* ...	......
23	*A. melettina* ...	Airay (T.), Thuppalu-kothi (C.T.), Wumboo (D.).
24	*Barbus sarana* ...	Kuruvah (C.T.).
25	*B. pinnauratus* ...	Panchala-kylie (T.).
26	*B. tor* ...	Nari-meen (C.T.).
27	*B. curmuca* ...	Kadi-meen (C.T.).
28	*B. lithopidos* ...	......
29	*B. melanampyx* ...	Kylie (T.).
30	*B. parrah* ...	Parrah-parlee (D.), Kylie (T.).
31	*B. burmanicus* ...	Sappauli-kendai (T.).

The letter 'T.' after the vernacular names indicates that these names are prevalent in the Tamil-speaking part of Travancore (south of Trivandrum) and were first recorded by Shankeranarayana Pillay (1929); the letters 'C.T.' indicate that they are the real Malayalam names prevalent in the central and northern parts of Travancore; and the letter 'D.' indicates that they are the Malayalam names given by Day in the *Fauna of British India*. Except in

LIST OF FRESHWATER FISHES AND THEIR LOCAL NAMES—(*contd.*)

Serial No.	Scientific name	Local Name
32	*Barbus denisonii*	Kendai (C.T.).
33	*B. melanostigma*	Kendai (T.).
34	*B. amphibius*	Oolee-parlee (D.), Urulen-kendai (T.).
35	*B. arulius*	Kendai (T.).
36	*B. mahecola*	Poovaulen-kendai (T.), Kuruvah-paral (C.T.).
37	*B. conchonius*	......
38	*B. punctatus*	Vattakkali (C.T.), Putter-perlee (D.).
39	*B. stigma*	Unda-kanni (T.).
40	*B. vittatus*	Cheli-kuthi (C.T.).
41	*B. filamentosus*	Kachi-paral (C.T.).
42	*Rasbora daniconius*	Kokanutchee (D.), Parava-kendai (T.).
43	*R. nilgiriensis*	Parava-kendai (T.).
44	*Rohtee bakeri*	Mullan-paral (C.T.).
45	*Danio malabaricus*	Cheela-pauray (T.).
46	*Perilampus laubuca*	......
47	*Chela boopis*	......
48	*Megalops cyprinoides*	Mullan-kanni, Palan-kanni (C.T.), Nanchil (T.).
49	*Haplochilus lineatus*	Manathu-kanni (T.).
50	*H. rubrostigma*	Poonjan (C.T.).
51	*Belone cancila*	Kolah (C.T.).
52	*Hemiramphus xanthopterus*	Murasu (C.T.).
53	*Ambassis thomassi*	Mullu-cheru (C.T.).
54	*A. nalua*	Sennel (T.).
55	*A. dayi*	Nandhan (C.T.).
56	*A. gymnocephalus*	Nandhan (C.T.).
57	*Gerres limbatus*	Prachil, Kootha-prachil (C.T.).
58	*Nandus marmoratus*	Mudhu-kolah, Mudhukala (C.T.), Mootahree (T.) & (D.).
59	*Pristolepis fasciata*	......
60	*P. malabarica*	Kalluringee (T.), Chempalli (C.T.), Chutichi (D.).
61	*Gobius striatus*	Kadel uluvay (T.).
62	*G. giurus*	Poonthy (T.), Wartee-poolah, Pooan and Kurdan (D.).
63	*Mastacembelus armatus*	Mookan-arakan, Pana-arakan (C.T.), Kal-aural (T.).
64	*M. guentheri*	Arakan, Pazhukkamundi (C.T.), Kal-aural (T.).
65	*Ophiocephalus marulis*	Choaree veral and Curavu (D.), Poo-viral (C.T.) & (T.).
66	*O. leucopunctatus*	Pulli-viral (T.), Cheru-meen (C.T.).
67	*O. micropeltis*	Karuvauhay (T.), Vaaha-meen (C.T.).
68	*O. striatus*	Viraal (T.), Vharaal (C.T.), Wara-hal (D.).
69	*O. gachua*	Para-koravai (T.), Manathu-kannan, Vattoon (C.T.), Karavu (D.).
70	*Anabas scandens*	Kallada-mutti, Undeecallee (C.T.), Undeecollee (D.).
71	*Polycanthus cupanus*	Caringannah (C.T.) & (D.).
72	*Etroplus suratensis*	Chauni-kendai (T.), Karimeen (C.T.).
73	*E. maculatus*	Setha-kendai (T.), Pallathi (C.T.) & (D.).

three cases, i.e. Undeecollee, Caringannah and Pallathi, the Malayalam names given by Day are not understood in any part of Travancore. Probably they are the names commonly used in British Malabar.

SYSTEMATIC DESCRIPTION OF THE FRESHWATER FISHES OF TRAVANCORE.

Order: *SYMBRANCHOIDEA.*

Family: SYMBRANCHIDÆ.

Anguilla bicolor, McClelland.

Anguilla bicolor, McClelland, *Calcutta Jour. Nat. Hist.,* v, p. 178.

Anguilla bicolor, Day, *Faun. Brit. Ind., Fish,* i, p. 87.

This fish is of a dark olive colour, becoming yellowish beneath, and is commonly found in the central part of Travancore. In the hilly regions it usually lives in crevices, between boulders, along the banks of rivers; while in the plains, it frequents rivers, which are somewhat marshy.

A. bicolor is supposed to have certain medicinal properties and is usually recommended as diet to people suffering from piles. However it is not very much esteemed as food by the better classes.

Order: *OSTARIOPHYSI.*

Family: SILURIDÆ.

Clarias magur, Day.

Clarias magur, Day, *Faun. Brit. Ind., Fish,* i, p. 115.

Usually found in the regions round about Trivandrum, and I was not able to find any specimens of it in the northern part of the State. It is not of any economic importance and is only eaten by the poorest sections of the population.

Saccobranchus fossilis, Day.

Saccobranchus fossilis, Day, *Faun. Brit. Ind., Fish,* i, p. 125, fig. 53.

Usually found in marshy regions in the plains. Fishermen are afraid of handling it, since it is believed that its pectoral spine is very poisonous and that wounds inflicted by it cause excruciating pain. It is not much esteemed as food owing to its foul feeding habits, and in certain parts it is regarded as a scavenger and is eaten only by the poorest classes.

Wallago attu, Schn.

Wallago attu, Day, *Faun. Brit. Ind., Fish,* i, p. 126, fig. 54.

Wallago attu, Vinciguerra, *Ann. Mus. Stor. Nat., Genova* (2), ix, p. 199.

A very cosmopolitan fish, much esteemed as food especially by the Christian section of the population. It has a wide distribution and is found abundantly in Kuttanad, where it is usually caught by the *airam choonda,* a device which is described elsewhere. In the hilly regions, during February, March and April, when the streams and rivers are partially dry it is usually caught by poisoning streams.

Callichrous bimaculatus, Bloch.

Callichrous bimaculatus, Day, *Faun. Brit. Ind., Fish,* i, p. 131, fig. 57.

Callichrous bimaculatus, Vinciguerra, op. cit., p. 201.

Ompok bimaculatus, Jerdon and Starks, *Ann. Carnegie Mus.,* xi, p. 434.

Specimens of this species have been recorded from Cape Comorin. They are silvery-white in colour with a black blotch on either side above the pectorals. The single specimen which I obtained was 8 in. long.

Callichrous malabaricus, Cuv. & Val.

Callichrous malabaricus, Day, op. cit., p. 133.

Found all along the Malabar coast south of Canara. In Travancore it is found usually in the plains during the rainy seasons. Reaches a maximum length of 18 in.

Pseudotropius sykesii, Day.

Schilbe sykesii, Jordan, *Mad. Jour. L. Sc.*, xv (1849), p. 335.
Pseudotropius sykesii, Day, op. cit., p. 140.

A small fish not exceeding 6 in. in length. Rather rare in the northern half of the State. Back bluish green, sides and abdomen silvery. The upper jaw is slightly longer and the palate contains two distinct patches of teeth.

Macrones chryseus, Day.

Pseudobagrus chryseus, Day, *Fish. Malabar,* p. 185.
Macrones chryseus, Day, op. cit., p. 148, fig. 63.

Recorded both from hilly regions and plains. One of the commonest species in Travancore, found in all the deep rivers and canals. It is a small fish, not exceeding 7 or 8 in. in length, and it is considered to be good for cooking.

Macrones gulio, Day.

Pimelodus gulio, Ham. Buch., *Fish. Ganges,* pp. 201, 379.
Macrones gulio, Day, op. cit., pp. 151-3, fig. 64.

In Trivandrum this fish is called *kadel-kelithi,* a name which indicates that it migrates into brackish and freshwater from the sea. Very abundant in brackish water lakes along the coast, which communicate with the sea and from them it ascends the rivers and canals. Not found in hilly regions or in the interior of the country.

Macrones oculatus, Day.

Bagrus oculatus, Cuv. & Val., *H.N. Poiss.,* xiv, p. 424.
Macrones oculatus, Day, op. cit., pp. 156-7.

Does not reach more than 4 or 5 in. in length, much esteemed as food and caught in plenty during the rainy seasons, in rivers, canals and fields, especially in the coastal regions. Colour silvery with a dark spot at the base of the commencement of the dorsal fin.

Macrones vittatus; Day.

Silurus vittatus, Bloch, *Icht.,* t. 371, fig. 2.
Macrones vittatus, Day, op. cit., p. 157.

Found abundantly from November to January in all rivers and canals which have a sandy bottom. When caught it makes a characteristic sound by erecting its dorsal spine. Body silvery with four longitudinal bands, the lowermost of which is somewhat faint. The average length is not more than five inches; much relished as an article of food.

Macrones montanus, Day.

Bagrus montanus, Jerdon, *Mad. Jour. L. Sc.,* xv (1849), p. 337.
Macrones montanus, Day, op. cit., p. 159.

Recorded by Shankeranarayana Pillay. I was not able to get a specimen. I include it here to make the list as complete as possible.

Macrones malabaricus, Day.

Bagrus malabaricus, Jerdon, op. cit., p. 338.
Macrones malabaricus, Day, op. cit., p. 160.

Abundant in the Kallada river, and, during certain seasons, brought in large numbers along with *M. vittatus* and *M. oculatus* to the fish markets of Quilon. The presence of a black spot on the shoulder, another at the base of the caudal and a dark band along the lateral line enables this species to be easily distinguished.

Family: CYPRINIDÆ.

Nemachilus botius, Day.

Cobitis botia, Ham. Buch., *Fish. Ganges,* pp. 350, 394.
Nemachilus botius, Day, op. cit., p. 227.

Day observes that the distribution of this species does not extend south of the river Kistna, but Shankeranarayana Pillay recorded its occurrence in Travancore. It is usually found in the hilly regions.

Nemachilus triangularis, Day.

Nemachilus triangularis, Day, op. cit., p. 234.

Restricted to the hill streams. Specimens were obtained from Mundakayam, Devikulam, Pirmed and Thenmalai.

Homaloptera maculata, Day.

Balitora maculata, Gray & Hardw., *Ill. Ind. Zool.*, i, pl. 88, fig. 2.

Homaloptera maculata, Day, op. cit., p. 243.

Recorded from the hilly regions in the neighbourhood of Punalcor and Thenmalai. Colour dull olive becoming lighter ventrally and with brown blotches on the body. A rather rare species of no marketable value.

Discognathus lamta, Day.

Cyprinus lamata, Ham. Buch., *Fish. Ganges,* pp. 343, 393.

Discognathus lamta, Day, op. cit., p. 246, fig. 87.

Recorded by Shankeranarayana Pillay from Trivandrum. Size small, not exceeding 7 or 8 in. in length. Eaten only by the poorer classes.

Discognathus jerdoni, Day.

Discognathus jerdoni, Day, op. cit., p. 247.

Found only in the hilly regions, usually prefers streams with rocky beds. Vernacular name *kal-nakki,* descriptive of its habit of remaining attached to rocks against strong currents.

Labeo dussumieri, Day.

Rohita dussumieri, Cuv. & Val., *H.N. Poiss.,* xvi, p. 258.

Labeo dussumieri, Day, op. cit., p. 262.

Common in all the deeper rivers of Travancore. Specimens up to 18 in. in length are often seen in the fish-markets of Alleppy, Changanacherry and Quilon. As this fish grows rapidly to a moderately good size and as it could be used for stocking purposes, it is of some importance to local fisheries.

Amblypharyngodon mola, Day.

Cyprinus mola, Ham. Buch., *Fish. Ganges*, pp. 334, 392.

Amblypharyngodon mola, Day, op. cit., p. 291, fig. 92.

First recorded from Travancore by Shankeranarayana Pillay, who thereby negatives the observation of Day that it is not found on the Malabar Coast.

Amblypharyngodon microlepis, Day.

Amblypharyngodon microlepis, Day, op. cit., p. 291.

From Day's account it would appear that this species is not found in the west coast of India. Though not abundant, I have obtained stray specimens in collections of small fish from Kuttanad and in the region round about Changanacherry. Shankeranarayana Pillay also recorded this species from Alleppy, a town which is only twenty-four miles from Changanacherry.

Amblypharyngodon melettina, Day.

Leuciscus melittina, Cuv & Val., *H.N. Poiss.*, xvii, p. 304.

Amblypharyngodon melettina, Day, op. cit., p. 292.

Found all over South India. In Travancore it occurs in all the rivers and canals of the coastal region. It is very abundant in the Sasthankotta lake.

Genus: **Barbus,** Cuv. & Val.

The genus *Barbus* is fairly well represented in Travancore. Nineteen species have been so far recorded and they are found all over the country, both in the hilly regions and in the plains, though in the latter they are more abundant. Most of the species are small, not exceeding 6 to 8 in. in length, but some like *B. sarana, B. tor* and *B. curmuca* reach a maximum length of one to over three feet. Their migratory habits enable them to be caught in plenty during the monsoon seasons. They are not generally so tasty as certain other freshwater fish e.g. *Etroplus suratensis* and for this reason their market value is comparatively low. However, in the country-sides they constitute an abundant source of fish supply during the monsoon seasons.

Barbus sarana, Day.

Cyprinus sarana, Ham. Buch., *Fish. Ganges,* pp. 307 and 388.

Barbus sarana, Day, op. cit., p. 300.

One of the larger types of *Barbus* found in Travancore. It enjoys a wide distribution throughout the State. In the hilly regions, where it reaches its maximum length, it is usually caught by poisoning the streams. Abundant in the rivers, canals and fields of the coastal plains.

Barbus pinnauratus, Day.

Puntius pinnauratus, Day, *Fish. Malabar,* p. 209, pl. xv, fig. 2.

Barbus pinnauratus, Day, op. cit., p. 301.

Found all along the base of the Travancore hills. During the monsoon they descend to the plains for breeding. The maximum length of the specimens which I obtained from this locality was only 6 in.

Barbus tor, Day.

Cyprinus tor, Ham. Buch., *Fish. Ganges*, p. 305.

Barbus tor, Day, op. cit., p. 307, fig. 104.

Not very common in Travancore. Occasionally found in the deeper parts of the Pamba and the Manimala rivers. Since this is a large and costly fish it is not disposed off in the market immediately, unless there is a good demand. If there is no demand the fish is kept alive and captive in a unique way. A strong string is looped through the mouth and opercle and the other end of it is tied to a tree on the bank of the river. The string is long enough to give the fish some freedom to swim about within the limited range of its length. When a prospective buyer comes it is hauled ashore and sold. At one place I saw five big specimens being kept alive in this manner.

Barbus curmuca, Day.

Cyprinus curmuca, Buchanan's *Journey in Mysore*, iii, p. 344.

Barbus curmuca, Day, op. cit., p. 310.

Very rare in Travancore. Usually caught from deep cool and shady parts of rivers in the hilly regions. It is supposed to be a very good fish, and the fortunate fisherman who catches one gets whatever price he demands. The specimen which I examined was about 2 ft. in length.

Barbus lithopidos, Day.

Barbus lithopidos, Day, *Faun. Brit. Ind. Fish*, i, p. 310.

Recorded by Shankeranarayana Pillay from Trivandrum and I saw one specimen in the local museum. I did not, however, succeed in getting one myself from any part of the country.

Barbus melanampyx, Day.

Barbus melanampyx, Day, op. cit., p. 316.

A very small species not exceeding 3 in. in length found in the hilly regions.

Barbus parrah, Day.

Puntius parrah, Day, *Proc. Zool. Soc. London* (1865), p. 301.

Barbus parrah, Day, op. cit., p. 317.

Black and green above, silvery below with a dark bluish line along the sides. Not very much esteemed as food.

Barbus burmanicus, Day.

Barbus burmanicus, Day, op. cit., p. 318.

Recorded by Shankeranarayana Pillay from Trivandrum and included here only to make this list as complete as possible.

Barbus denisonii, Day.

Labeo denisonii, Day, *Proc. Zool. Soc. London* (1865), p. 299.
Barbus denisoni, Day, op. cit., p. 320.

First recorded by Day from Mundakayam (Travancore). I was able to obtain specimens about 2½-3 in. in length from Munnar, Devikulam and Kangirapally.

Barbus melanostigma Day.

Barbus melanostigma, Day, op. cit., p. 320.

A small fish not exceeding 3 in. in length. Colour silvery with a light band along the sides and a black blotch on each side of the tail region.

Barbus amphibius, Day.

Capoeta amphibia, Cuv. & Val., *H.N. Poiss.*, xvi, p. 282.
Barbus amphibius, Day, op. cit., p. 322.

Commonly found in the coastal plains in rivers, canals and fields during all seasons. It is small and is caught along with other species of *Barbus.* Steel blue above with a black blotch on each side of the tail.

Barbus arulius, Day.

Systomus arulius, Jerdon, *Mad. Jour. L. Sc.,* xv (1849), p. 317.
Barbus arulius, Day, op. cit., p. 322.

A very small species, not exceeding 2 or 3 in. in length, recorded from the vicinity of Trivandrum and Nagerkoil. As a food its value is practically negligible.

Barbus mahecola, Day.

Leuciscus mahecola, Cuv. & Val., *H.N. Poiss.*, xvii, p. 305.
Barbus mahecola, Day, op. cit., p. 323, fig. 105.

Commonly found along the base of the Travancore hills, but during the monsoon it descends to the plains and is caught in plenty from rivers, canals and fields along with other species of *Barbus,* especially *B. pinnauratus.*

Barbus conchonius, Day.

Cyprinus conchonius, Ham. Buch., *Fish. Ganges,* pp. 317, 389.
Barbus conchonius, Day, op. cit., p. 325.

Recorded by Shankeranarayana Pillay from Trivandrum. Length not exceeding 5 in. As it is never found in large numbers it has no remarkable value.

Barbus punctatus, Day.

Puntius punctatus, Day, *Proc. Zool. Soc. London* (1865), p. 302.
Barbus punctatus, Day, op. cit., p. 326.

Does not seem to exceed 3 in. length. Olive-green above becoming white on the abdomen. The dorsal fin, which is tipped with orange, bears two rows of black spots. In some specimens these rows of black spots are altogether absent.

Barbus stigma, Day.

Leuciscus stigma, Cuv. & Val., *H.N. Poiss.*, xvii, p. 93.
Barbus stigma, Day, op. cit., p. 329.

Usually found in Kuttanad and its environs. It has a bitter taste when cooked and so fishermen, who can identify it by sight, always reject it if caught in the nets.

Barbus vittatus, Day.

Puntius vittatus, Day, *Proc. Zool. Soc. London* (1865), p. 303.
Barbus vittatus, Day, op. cit., p. 333.

A very small fish not exceeding 1½ in. in length. It is not used for cooking, as it is believed to have a bitter taste when cooked.

Barbns filamentosus, Day.

Leucius filamentosus, Cuv. & Val., *H.N. Poiss.*, xvii, p. 96.
Barbus filamentosus, Day, op. cit., p. 333.

These fish are natural inhabitants of the hilly regions, but during the rains they descend to the plains and deposit their spawn in shallow fields among submerged stumps of straw. During migration they are caught in large numbers.

Rasbora daniconius and **R. nilgiriensis**

Recorded by Shankeranarayana Pillay, but I did not succeed in getting either of them in the regions from where I obtained the greater part of my collection.

Rohtee bakeri, Day.

Rohtee bakeri, Day, *Proc. Zool. Soc. London* (1873), p. 240.
Rohtee bakeri, Day, op. cit., p. 340.

A small fish reaching a maximum length of 5 in. Usually found in the Manimala river and its branches and was first recorded by Day from Kottayam. The vernacular name is *mullan-paral;* and *paral* is the name by which many of the smaller species of *Barbus* are known. The prefix *mullan* means that this species contains numerous spines. So it would appear that in the vernacular nomenclature the distinction between the genera *Barbus* and *Rohtee* is not noticed.

Danio malabaricus, Day.

Perilampus malabaricus, Jerdon, *Mad. Jour. L. Sc.*, xv (1849), p. 325.
Danio malabaricus, Day, op. cit., p. 355.

Recorded by Shankeranarayana Pillay from Trivandrum.

Perilampus laubuca, Day.

Cyprinus laubuca, Ham. Buch., *Fish. Ganges*, pp. 260, 384.
Perilampus laubuca, Day, op. cit., p. 360, fig. 112.

A small species not exceeding 3½ in. in length, of no economic importance. Stray specimens when caught along with other small fishes are sold with the catch. I have not found it abundant in any part of the country. Only solitary specimens are occasionally found even in big catches.

Chela boopis, Day.

Chela boopis, Day, *Proc. Zool. Soc. London* (1873), p. 708.
Chela boopis, Day, op. cit., p. 366.

A rather small species which seems to be restricted to the southern part of the State.

Megalops cyprinoides, Day.

Megalops cyprinoides, Day, op. cit., p. 402, fig. 116.

Among the *Clupeidae* there are some species which migrate into rivers during breeding seasons, but in Travancore though there are many species of *Clupea,* which frequent its shores, I have not found any migratory forms in freshwater. The only outstanding exception is *Megalops cyprinoides.* This fish reaches a maximum length of about 14 in. and is found in most of the rivers and canals, near the coast, during certain seasons.

Family: CYPRINODONTIDÆ.

Haplochilus rubrostigma, Day.

Aplocheilus rubrostigma, Jerdon, *Mad. Jour. L. Sc.,* xv (1849).
Haplochilus rubrostigma, Day, op. cit., p. 416.

A small fish, not exceeding 3 in. in length, commonly found in tanks, canals and fields, especially those which contain plenty of water-weeds. It is not an edible species. A closely related species *H. lineatus* has been recorded by Shankeranarayana Pillay from Sasthankotta lake.

Family: SCOMBRESOCIDÆ.

Belone cancila, Day.

Belone cancila, Cuv. & Val., *H.N. Poiss.*, xviii, p. 455.
Belone cancila, Day, op. cit., p. 420, fig. 136.

One of the commonest fish in Kuttanad from May to August. Prefers shallow canals and fields and goes about in shoals. Never found in the hilly regions except during the monsoon season.

Hemiramphus xanthopterus, Cuv. & Val.

Hemiramphus xanthopterus, Cuv. & Val., *H.N. Poiss.*, xix, p. 47.
Hemiramphus xanthopterus, Day, op. cit., p. 425.

Found abundantly in the region between Thottapally lock and the Vembanad lake, in the low-lying fields and shallow canals. Confined to the narrow belt of coastal plain, its distribution does not seem to extend beyond 25 miles from the coast. Specimens have also been recorded from Trivandrum and from the canals of South Travancore.

Order: *ACANTHOPTERYGII.*

Family: PERCIDÆ.

Ambassis dayi, Bleeker.

Ambassis dayi, Day, op. cit., p. 487.

Very common in Kuttanad during all seasons, also found in the hilly regions of North and Central Travancore. Not recorded from South Travancore and even stray specimens have not been observed south of the Varkala tunnel. Besides this species *A. thomassi* and *A. gymnocephalus* have also been recorded from Travancore. Although the latter is found in the sea, specimens have been obtained from fresh and brackish waters as well.

Family: NANDIDÆ.

Nandus marmoratus, Cuv. & Val.

Gobius nandus, Ham. Buch., *Fish. Ganges*, pp. 96, 370.
Nandus marmoratus, Day, *Faun. Brit. Ind. Fish*, ii, p. 82, fig. 39.

Widely distributed throughout Travancore. Found in fresh and brackish waters and in marshy fields among water-weeds. Though it does not exceed 4½ in. in length it does considerable damage to freshwater fisheries as it preys upon young Cyprinoids.

Pristolepis malabarica, Day.

Catopra malabarica, Gunther, *Ann. Mag. Nat. Hist.*, Ser. 3, xiv (1864), p. 375.
Pristolepis malabarica, Day, *Faun. Brit. Ind. Fish*, ii, p. 84.

Usually found in the coastal plains especially in Kuttanad. Remains close to the banks hiding beneath overgrowths, hence it is difficult to catch in cast nets. Travancore specimens are of a reddish brown colour, hence the vernacular name *chempalli*. A closely allied species, *P. fasciata* has been recorded from the borders of Vembanad lake.

Family: GOBIIDÆ.

Gobius striatus, Day.

Gobius striatus, Day, *Faun. Brit. Ind. Fish.*, ii, p. 262.

The genus *Gobius* is not very much liked as an article of food. Though five species have been recorded from Travancore, only two of them are purely freshwater forms. Of the rest, two (*G. griseus* and *G. personatus*) are brackish-water forms and one (*G. tentacularis*) is purely marine. *G. striatus* is found in the mouths of rivers, which open into the brackishwater lakes. The Travancore specimens are darkish olive with a bluish tinge along the sides, brownish white beneath, with irregular vertical bands in the dorsal half of the body.

Gobius giuris, Ham. Buch.

Gobius giuris, Ham. Buch., *Fish. Ganges*, pp. 51, 366, pl. 33, fig. 15.
Gobius giuris, Day, *Faun. Brit. Ind. Fish.*, ii, p. 266.

In general appearance this fish resembles the previous species. It differs in colour and shows spots and blotches on the back and sides of the body.

Family: RHYNCHOBDELLIDÆ.

Mastacembelus armatus, Lacep.

Mastacembelus armatus, Lacep., *H.N. Poiss.*, ii, p. 286.
Mastacembelus armatus, Day, *Faun. Brit. Ind. Fish.*, ii, p. 334.

A common fish in all the rivers and canals of Travancore, confining itself to the regions beyond tidal influence. During summer when the water in the rivers and canals in Kuttanad become slightly brackish, these fish die in large numbers.

Mastacembelus guentheri, Day.

Mastacembelus guentheri, Day, *Faun. Brit. Ind. Fish.*, ii, p. 334.

Found in marshy canals and rivers, always frequenting places which are not much disturbed by currents. It usually deposits its spawn under accumulations of decaying leaves and weeds. This fact has been used with advantage by fishermen for catching it in large numbers.

Family: OPHIOCEPHALIDÆ.

Ophiocephalus marulis, Ham. Buch.

Ophiocephalus marulis, Ham. Buch., *Fish. Ganges,* pp. 65, 367.

Ophiocephalus marulis, Day, *Faun. Brit. Ind. Fish.*, ii, p. 360.

Day describes the presence of a black ocellus on the upper part of the base of the caudal, but in the specimens which I obtained in Travancore—one of which is preserved at the Madras Government Museum—such an ocellus is not present. Found in most of the rivers of Travancore and very much esteemed as food.

Ophiocephalus leucopunctatus, Sykes.

Ophiocephalus leucopunctatus, Sykes, *Trans. Zool. Soc. London,* ii, p. 352.

Ophiocephalus leucopunctatus, Day, *Faun. Brit. Ind. Fish.*, ii, p. 361.

Regarded as one of the best edible fish of Travancore. It normally grows to a maximum length of about 3 ft. and being a very strong fish can easily tear through ordinary cast nets with the strong lashes of its tail. It is therefore usually shot down with gun or with arrows.

Ophiocephalus micropeltes, (Kuhl. & v. Hass).

Ophiocephalus micropeltes, Cuv. & Val., *H.N. Poiss.*, vii, p. 427.

Ophiocephalus micropeltes, Day, *Faun. Brit. Ind. Fish.*, ii, p. 362.

Grows to a large size. The largest specimen I saw was from Thodupuzha. It is very rare in the plains and is regarded as one of the best food fish of the country.

Ophiocephalus striatus, Bloch.

Ophiocephalus striatus, Day, *Faun. Brit. Ind. Fish.*, ii, p. 363.

Commonly found in all rivers, canals and tanks. According to Day the number of rays in the dorsal fin is usually 37-45, but in the specimens which I obtained from Travancore, the number is only 30-35.

The species of *Ophiocephalus* so far described are best suited for rearing in tanks and large wells. They thrive well in captivity and breed without difficulty. I met an enterprising landholder in Kuttanad who keeps a good stock of all these three species in a specially enclosed tank, but he does not profit by their breeding. Since large numbers are kept in the same tank the eggs and young ones are preyed upon and destroyed by other fish.

Ophiocephalus gachua Ham. Buch.

Ophiocephalus gachua, Ham. Buch., *Fish. Ganges,* pp. 68, 367.

Ophiocephalus gachua, Day, *Faun. Brit. Ind. Fish.*, ii, p. 364.

This fish is eaten only by the poorest class of people. There is a popular belief that these fish ascend the clouds when they take their store of water, and fall to earth again with the rain.

Family: LABYRINTHICI.

Anabas scandens, Day.

Perca scandens, Daldroff, *Trans. Linn. Soc.*, iii (1797), p. 62.

Anabas scandens, Day, *Faun. Brit. Ind. Fish.*, ii, p. 367, fig. 120.

Found all over Travancore. The possession of accessory respiratory organs enables it to live even in muddy water. It does not exceed 7 in. in length; it is esteemed as food by certain sections of the population.

Polycanthus cupanus, Cuv. & Val.

Polycanthus cupanus, Cuv. & Val., *H.N. Poiss.*, vii, p. 357.

Polycanthus cupanus, Day, *Faun. Brit. Ind. Fish.*, ii, p. 368, fig. 121.

A small inedible species, usually found in canals and tanks in the plains, sometimes extending into the interior through the larger rivers. In the fully-grown adult the body is a rifle green with a round dark spot at the base of the caudal. Day mentions a variety in which the body is reddish with two horizontal bands extending from the snout and slowly fading towards the tail. These are about half the length of the former type and are the young of the species. When reared in tanks within about two months they assume the adult colouration.

Family: CHROMIDES.

Etroplus maculatus, Day.

Etroplus maculatus, Day, *Faun. Brit. Ind. Fish.,* ii, p. 429, fig. 150.

Rather small in size, not exceeding 3 in. in length. Believed to be very tasty, especially when fried. *E. maculatus* is very pugnacious and both parents guard the eggs and the young during their early development. Eggs are laid in the bottom mud in places sheltered by overgrowths. The species is abundant in the lower regions of all the rivers of Travancore and in the canals, tanks and fields of Kuttanad.

Etroplus suratensis, Day.

Etroplus suratensis, Day, *Faun. Brit. Ind. Fish.,* ii, p. 430.

Considered to be the best food fish, and there is always a good demand for it all over the country. It is abundant in brackish waters especially in the Vembanad lake. These brackishwater forms are somewhat dark in colour and grow to a much larger size than the purely freshwater form. During the breeding season the colouration becomes brilliant and both parents guard the eggs and the young.

METHODS OF CAPTURE.

The different methods employed for catching freshwater fishes can be classified as (1) fixed engines, and (2) non-stationary devices. Fixed engines are those contrivances, which are fixed permanently, or for a considerable time, to one definite place. In Travancore this type includes traps of different kinds, nets fixed to the mouths of water exits, 'tripod nets' and 'trap ponds'. The second type is represented by cast nets, seine nets, angling, torch-light fishing and shooting.

Freshwater fisheries are well developed in the region round about the southern shore of the Vembanad lake. This part of the country known as Kuttanad is popularly described as fen country. It is a low-lying strip of land, over which three of the important rivers discharge their waters into the Vembanad lake, through innumerable branches, which are in turn interconnected by a close net-work of deep canals. The average elevation of land is two or three feet below the level of water in the rivers and canals, so that, except when under cultivation, the fields are covered with two or three feet of water. This stretch of watery land, intersected with deep canals and perennial rivers, possesses all the natural advantages of excellent fishing grounds to the local inhabitants, for whom fish constitutes an important article of food. Many species of freshwater fishes though usually not exceptionally large, are met with and fishing methods of different types are commonly used. These devices, so widely used in Kuttanad, are also prevalent to a limited extent in other parts of the country along the banks of rivers and water-courses.

The commonest method of fishing is with simple cast nets, made of fine twisted cotton, with meshes varying from three-fourth to three-eighth of an inch. These nets are used in different ways. Usually they are cast from the bank or from a canoe. As a preliminary preparation the fisherman throws food in suitable places to attract the fish. Roasted rice, bran or small pieces of cocoanut oil cakes are chiefly used. After an hour or so he casts his net in these spots. From the nature of the food thrown it is evident that only certain types of fish, e.g. *Ophiocephalus*, *Etroplus*, *Barbus* and *Labeo*, and freshwater prawns can be caught by this method. Most of these species do not swim about freely through the day and so the cast nets are used either in the morning or towards dusk. It is obvious that this method of fishing, especially if the mesh is not too small, is practically innocuous, except during breeding and migratory seasons.

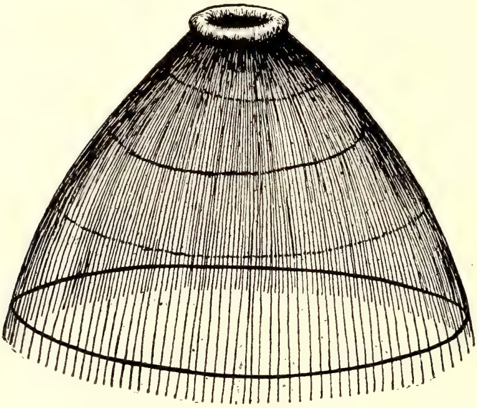
Under normal conditions only a very small portion of the stock in any water can be taken by means of cast nets and so other methods are usually adopted by those who make fishing a livelihood. Along the banks of most rivers and canals there are overhanging growths of semi-aquatic plants and *Pandanus*, between the interlocking stems and roots of which fishes find a safe retreat. The parts of these over-growths lying under water are surrounded by two or three cast nets held in position by two or three men. A fourth man then dives under and violently disturbs the water. By this process the fish are frightened and driven into the nets. The upper edges of the nets are then let down and the fish thus entrapped are hauled ashore or into an awaiting canoe. In the same process a single net of the seine net type, with an upper float line and a lower lead line is used. As this type of net remains in position owing to the presence of a float line, a fewer number of men can work it. This method has been practised for a very long time and, as the supply of fish decreased, it has been more and more intensively exploited, so that, in many places, overgrowths have been completely destroyed and shelter-loving fish are now consequently very scarce.

The cast net is also often used as a fixed engine. We have already stated that the fields in Kuttanad are normally covered with two or three feet of water. So one of the first steps in cultivation is to erect bunds all round the fields and with the help of oil-engines to pump the water out into adjoining rivers or canals. At the outer ends of the drainage pipes of the propellor, a large half-inch mesh net is firmly fixed. Since the entire volume of water in the field is drained through the pipe, all the fish including the very young fry are caught in the net as the water passes through it.

There are certain types of fish, e.g. *Etroplus suratensis*, *E. maculatus*, *Wallago attu*, *Mastacembelus* and some of the *Ophiocephalus*, which are regarded as superior food fishes. To catch such fish in large numbers certain special methods have been evolved, based on a knowledge of some peculiar habit. For catching *E. suratensis* during and after the monsoon, long narrow strips of the white tender petiolar sheaths of the plantain tree or the white tender leaves of the cocoanut palm are cut into pieces of uniform length and tied to a long coir rope to form a streaming festoon. Each end of this festoon is held by a man standing knee-deep in water by either bank. They wade forward along the banks, dragging the festoon with them on the surface of the water. A third man with a net, ready to be cast, follows in a canoe, a few yards behind the apex of the festoon, carefully observing the surface. Fish, probably frightened by the white line, swim towards the middle of the stream and reaching the apex dive deep, in an attempt to escape. In doing so they let out a few bubbles of air. The man with the net who watches for these bubbles immediately casts his net and it is only in rare cases that he misses his object. Though this device is usually meant for catching *Etroplus*, other fish may also be obtained.

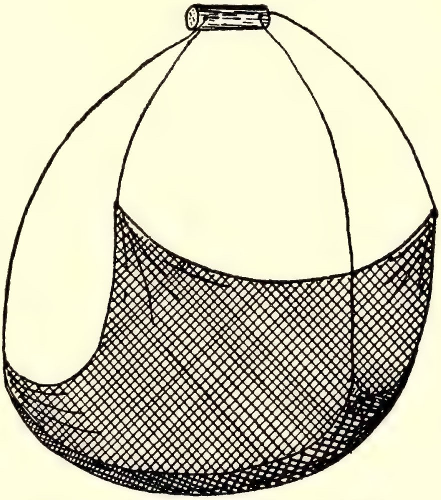
For catching *Etroplus suratensis* a second device has been perfected, based on knowledge of its breeding habits. *E. suratensis* usually spawns in August and September. During these months, fishermen gather the petiolar ends of the cocoanut leaves and cut out the broad basal part to a length of nearly one and a half feet. These are fixed in pairs under water in the submerged paddy fields, with their basal ends upwards and in such a way that the concave inner surfaces face each other, thus enclosing a hollow space between them. The device thus set up is termed *oli* by the fishermen. The fish, which are in the habit of selecting protected spots for spawning, naturally choose these enclosed spaces in the *oli* and after depositing the eggs both the parents keep guard over them. The fisherman comes on his rounds a week after fixing the *olis* and locating them one by one, plunges a basket-like bamboo structure called an *ottal* over each *oli* in succession. The fish are thus entrapped in the *ottal* from which they are taken out by hand.

The *ottal* is made of thin rounded bamboo rods which are tied up and shaped like a large inverted basket, as shown in the accompanying diagram (text-fig. 1). At the top there is a thick ring-like aperture about six inches across, through which the entrapped fish are taken out by hand.



Text-Fig. 1.—Bamboo frame called *ottal* in Malayalam.

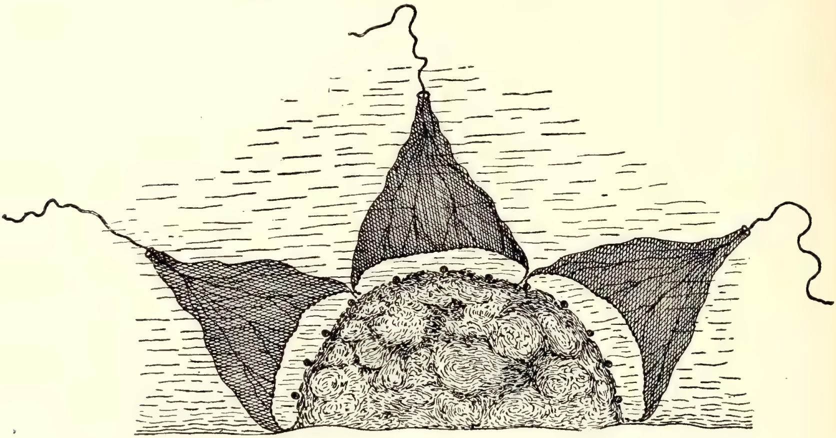
Etroplus maculatus, which is very palatable, is usually caught by young girls as a useful past-time. Certain small nets which may conveniently be called 'Float nets' are used for this purpose. They are made of pieces of netting about 2½ ft. square, which are cut out from old discarded cast nets. The four corners are fastened to four pieces of thin coir, of equal length and the free ends are tied to a piece of pith, which is large enough to keep the net suspended in water. A number of these nets are thrown into the water about 4 ft. away from the bank and about 20 ft. apart. These are properly spread out with a long pole, and a small quantity of rice bran, made into a paste, is thrown into the centre of each net. As already observed, fish of this species frequent the edges of canals, tanks and fields and are therefore easily attracted by the food in the net. Further, they have a peculiar habit of remaining for a considerable time at the spot where they have obtained food, so that when the nets are lifted up vigorously at the end of a pole, each usually contains two or three fish. This type of net is called *Uri-vala* in Malayalam and it is represented in text-fig. 2.


Text-Fig. 2.—The Float-net, *uri-vala*.

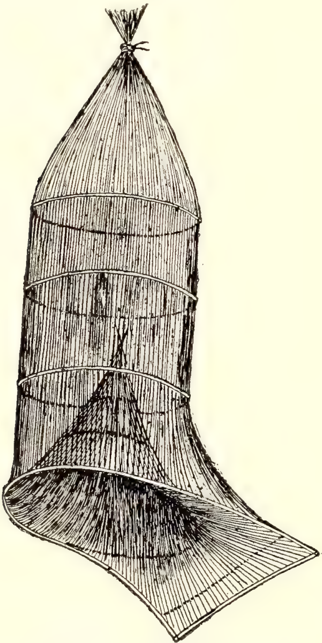
The process of catching *Mastacembelus armatus* and *M. guentheri* is also based on knowledge of their breeding habits. These fish usually prefer a muddy bottom and when entrapped in cast nets, instead of swimming towards the meshes, like other fish, they wriggle into the mud at the slightest disturbance.

Mastacembelus spawns among accumulations of decaying vegetable matter by the banks of marshy canals or rivers, in which currents are not very strong. In such localities, fishermen select suitable spots and fix a number of vertical poles in a semi-circular row, close to the bank. The area of water thus enclosed is filled up with masses of dry cocoanut leaves, Pandanus leaves, twigs and straw. This affords a suitable place for the fish to spawn, they make their way into the heap in large numbers. Once a week the sides of the heap are covered with two or three cast nets as shown diagrammatically in text-fig. 3 and the mass of decomposing straw and leaves is lifted out in small quantities. By this operation the fish are driven into the surrounding nets. The straw and leaves are then replaced within the enclosure for repeating the process in the succeeding weeks.

From the middle of June to the middle of October one of the most important and lucrative sources of the professional fisherman's income is prawn-fishing. Though prawns are not fish, they are a sufficiently important food commodity, to be included in this account. Freshwater prawns breed from August to October. They deposit their eggs in shallow waters, and the extensive fields, covered with two to three feet of water, afford excellent breeding grounds. During this season they are caught in plenty by a unique method. The visceral mass of a large snail (*Ampullaria*) is tied to a thin string and suspended in mid-water by a small float. A number of these bait-bearing floats are thrown over a limited area and the fisherman waits in a small canoe, with an *Ottal* (ref. text-fig. 1). When a prawn nips at a bait the float moves and the fisherman rows his canoe noiselessly towards the spot and plunges his *ottal* over the float. The prawn thus entrapped is taken out by hand. Though this process seems apparently slow and tedious, during the best part of the prawn season, a single fisherman working for about six hours catches about a hundred to hundred and fifty prawns.



Text-Fig. 3.—The setting of cast nests for catching *Mastacembelus*.

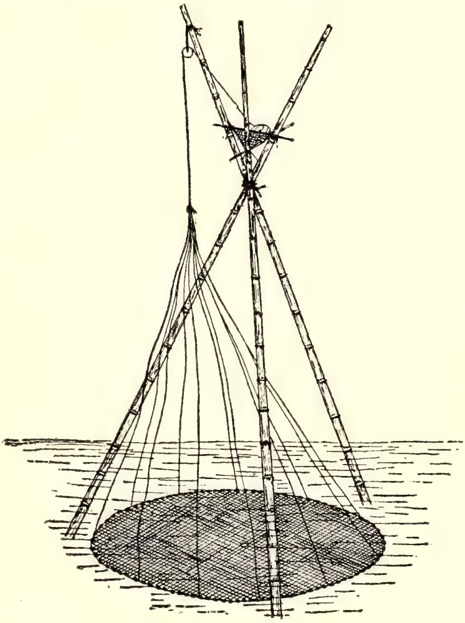


Text-Fig. 4.—Typical fish trap of Travancore.

Traps of various sizes are used all over the country, and whatever be their dimension, they are all constructed on the same plan (ref. text-fig. 4). They are made of bamboo rods and each has a wide funnel-shaped mouth, which opens into a wide chamber surrounding it. The distal ends of the rods forming this chamber are free and loose, but when the traps are set up these ends are brought together and tied up with a string as shown in the diagram, thus making the outer chamber a completely closed one. Fish which enter the mouth of the trap pass through the internal opening of the funnel into the surrounding outer chamber wherefrom they cannot escape. In the plains small traps about 4½ ft. long and 3½ ft. in circumference are used by the field-labourers known as *pulias*. They are fixed in the water inlets in the bunds of paddy fields and innumerable quantities of small fry and young fish, which easily escape through the meshes of cast nets, are caught. In the hill regions, especially along the course of the Manimala river, traps 8-10 ft. long and 20-30 ft. in circumference are used during the monsoon season. Some of them are set up with their mouths pointing upstream to entrap fish descending to the plains with the flood water; while others are set up with their mouths pointing downstream to entrap those fish which ascend the rivers for breeding purposes. In some places conical nets fixed to a wide circular frame are used instead of bamboo traps.

In hilly places where the streams are long, narrow and deep, with steep sides formed of jagged rocks, cast nets cannot be used. In such places during the rainy season, when the currents are strong and dangerous, traps are set up. But during the hot weather these streams are comparatively dry and appear like a succession of pools united by more or less insignificant channels. The larger fish, which do not descend to the plains, resort to these pools. At the slightest sign of danger they take refuge under boulders and in crevices. In such places angling is widely practised. Occasionally, however, some of these pools are poisoned with a mixture of copper sulphate and the powdered seed of *Jatropha*, or of the talipot palm. Some years back dynamiting was also practised, but now, owing to the scarcity of fish this practice is dying out.

In parts of the hilly region, where the river-bed is sandy and where the water is clear and shallow, a device called *mukkali vala* (tripod net) is used. Three long bamboo poles are fixed in the river-bed and they are tied together at a point some distance below their free ends, as shown in text-fig. 5. Between the diverging ends of the poles, above the knot, a small platform is constructed and a pulley is fastened to the distal end of one of the poles. A wide circular net with a number of long strips tied to its edge, is then spread on the river-bed, between



Text-Fig. 5.—The tripod net, *mukkalivala*.

the poles. These strings are taken up and knotted together and tied to the lower end of a rope passing over the pulley. The other end of this rope is held by a man sitting on the platform. After the device has been thus set up food is thrown into the net and this attracts fish in large numbers. The man on the platform keeps a close watch and when sure that a good catch has collected in the net, he gives a vigorous pull to the rope, which lifts the edges of the net above water-level.

In some of the larger and deeper rivers, such as the Pamba and the Manimala, *Wallago attu* is very abundant. These are usually caught by line and hook. Hooks with line about 1½ ft. long are tied to a long rope at intervals of 2 ft. thus making a long festoon of short-lined hooks. This device called *airam choonda* is tied across the river at night-fall and each hook is baited with small living frogs. The fisherman waits in a canoe near the bank and whenever he hears loud splashes in the water he knows that a bait has been taken.

FACTORS INJURIOUS TO THE DEVELOPMENT OF FRESHWATER FISHERIES.

Freshwater fisheries differ from marine fisheries in one important respect. In the sea, the methods of fishing or the exploitation of the fisheries, however intensive, have little or no influence on supply of fish. For instance the Herring fisheries of the North Sea and the English Channel have been intensively exploited since the introduction of the steam trawler. Still the supply of herrings in any particular year does not show any appreciable diminution. This does not necessarily mean that the supply is constant. Statistical records maintained at the places of landing show that quantitative fluctuations occur from year to year, but it has now been definitely proved that this is due entirely to variations in the food supply of the young herring and are not the result of intensive catching. The seas being wide expanses of water, the size of the nets used bear only a very insignificant proportion to the entire area and hence there is always the possibility of large numbers of fish escaping capture and thus maintaining a breeding reserve for the succeeding year.

In freshwater areas conditions are different. The rivers, canals and tanks being comparatively limited in extent, intensive and destructive methods of fishing leave indelible marks on the succeeding years and perchance lead to the despoilation of the fisheries altogether.

In general, it may be stated that under normal conditions fish multiply rapidly, producing enormous numbers of eggs and young which are distributed over a wide area by migratory habits or periodic floods. If the area over which the young scatter, affords favourable environmental conditions, plenty of food and protection, it will yield in the succeeding year an abundant catch. If, however, the fish are caught in plenty during their breeding season and if the fry are destroyed in enormous numbers it will naturally follow that the succeeding years will experience a progressive diminution in the supply of fish.

The intensity of fishing in any particular locality increases directly in proportion to the increase in the numerical strength of the population of the locality and increase in the price of the commodity. Thus the whole problem of fisheries and fishing comes under the simple economic rule of Supply and Demand. As the demand for fish increases it gives greater impetus to the exertions of the fisherman to capture more fish. New methods of capture are devised, fixed traps are set up, the sizes of mesh are decreased and every type of fish caught, without consideration of size or food value. This propensity of the fisherman is the direct consequence of his complete ignorance of the biological aspect of the problem. He does not stop to consider whence the next year's supply is to come, when he destroys spawn fry and also the natural environment and the shelter of the fish. He does not realize that in the long run he will be depopulating the fisheries and ruining his own source of income.

The unpleasant consequences of this wasteful destruction are well exemplified in the condition of the freshwater fisheries in Kuttanad. The growth of the population of Kuttanad during the last fifty years has been very rapid. The direct result has been that the swamps and marshes which covered the greater part of the area have been drained, low-lying stretches of paddy fields have been reclaimed into extensive cocoanut gardens suitable for habitation, while improved methods of field drainage quickened up the process of cultivation. Thus a large freshwater area, which afforded the most suitable habitat for fish, gradually diminished in extent and the value of the existing fisheries began to show signs of deterioration. On the other hand, the increase in population stimulated a greater demand for fish and the fishermen to meet this enhanced demand exploited the resources so thoroughly, that year by year the supply of fish diminished and now, one can almost say, that this area, once so rich in its fisheries, is more or less denuded of fish. The price of fish which always bears an inverse proportion to the supply, also increased by rapid bounds so that fish has now become a luxury, which can only be enjoyed by those who can afford it. These facts amply support the observation of Dr. Day that 'the intensity of fishing depends on the numerical strength and nature of the population and that the country or district which is most populated will be the most denuded of fish'.

It is difficult to collect any accurate figures regarding the freshwater fisheries as they are entirely in the hands of private owners, and unrestricted fishing is carried on all the year round. No satisfactory or accurate data can be collected about river, lake and tank fisheries. However, some idea of the conditions prevailing in the entire area can be gathered from the quantity of fish caught annually from paddy fields, during the preliminary drainage operations, before cultivation. In this process oil-engines are often used, especially where the fields are extensive. When the water is thus driven out, nets are fixed to the outer ends of the drain pipes and by this means all the fish including small fry are caught. When the fields are more or less completely drained, the larger fish which still remain in shallow puddles and pits, are caught by hand or in baskets. As large quantities of fish are obtained in this way, the cultivator gives out the right of fishing on a system of contract. The daily catch is measured out in baskets of a standard size holding about 60 lbs. of fish and the price is fixed on the total catch till the particular field is completely drained.

Some of the bigger cultivators have maintained regular and authentic accounts of their total income including the income from fisheries. Fortunately some of them have made entries of the quantity of fish obtained from year to year and their corresponding prices. From such systematically maintained account-books of a few cultivators I was able to gather sufficient information of the condition of field fisheries. I had the opportunity of examining the account-books of twenty-one cultivators, but in many cases the information was not complete owing either to the neglect of entering the income from fisheries during certain years or not mentioning the quantity of fish obtained. However, all of them point to the same general conclusion and so I have only selected three typical examples from places far removed from one another.

STATISTICS OF FIELD FISHERIES OF KUTTANAD.

Example No. I.

Year.	Area of field.	Quantity of fish obtained.	Total price.			Price per 100 lb.			Value of fisheries per unit area of 100 acres.		
			RS.	A.	P.	RS.	A.	P.	RS.	A.	P.
1923	640 acres.	5,100 lbs.	90	0	0	1	12	3	14	1	0
1924	480 ,,	4,200 ,,	75	0	0	1	12	7	15	10	0
1925	640 ,,	4,800 ,,	98	0	0	2	0	4	15	4	0
1926	640 ,,	4,200 ,,	85	0	0	2	0	4	13	4	6
1927	640 ,,	4,200 ,,	97	0	0	2	4	11	15	2	6
1928	640 ,,	3,600 ,,	112	0	0	3	1	9	17	8	0
1929	480 ,,	2,400 ,,	68	0	0	2	13	4	14	2	5
1930	640 ,,	3,000 ,,	110	0	0	3	10	8	17	3	0
1931	640 ,,	2,400 ,,	98	0	0	4	1	4	15	5	0
1932	640 ,,	1,500 ,,	63	0	0	4	3	2	9	13	6
1933	480 ,,	1,200 ,,	55	0	0	4	9	4	11	7	11

Example No. II.

Year	Area of field	Quantity of fish obtained	Total price			Price per 100 lbs.			Value of fisheries per unit area of 100 acres.		
			Rs.	A.	P.	Rs.	A.	P.	Rs.	A.	P.
1925	40 acres	720 lbs.	15	0	0	2	1	4	37	8	0
1926	40 ,,	660 ,,	12	0	0	1	13	1	30	0	0
1927	40 ,,	600 ,,	14	0	0	2	5	4	35	0	0
1928	40 ,,	480 ,,	15	0	0	3	2	0	37	8	0
1929	40 ,,	480 ,,	3	0	0	2	12	3	32	8	0
1930	40 ,,	240 ,,	9	0	0	3	1	0	22	8	0
1931	40 ,,	240 ,,	10	0	0	4	2	8	25	0	0
1932	40 ,,	240 ,,	10	0	0	4	2	8	25	0	0
1933	40 ,,	240 ,,	11	0	0	4	9	4	27	8	0

Example No. III.

Year	Area of field	Quantity of fish obtained	Total price			Price per 100 lbs.			Value of fisheries per unit area of 100 acres.		
			Rs.	A.	P.	Rs.	A.	P.	Rs.	A.	P.
1928	200 acres	1,800 lbs.	55	0	0	3	0	11	19	0	0
1929	200 ,,	1,440 ,,	40	0	0	2	12	5	20	0	0
1930	200 ,,	1,200 ,,	42	0	0	3	8	0	21	0	0
1931	200 ,,	900 ,,	40	0	0	4	7	1	20	0	0
1932	200 ,,	720 ,,	32	0	0	4	7	1	16	0	0
1933	200 ,,	600 ,,	27	0	0	4	8	0	13	8	0

These tables reveal a number of interesting facts with regard to the condition of freshwater fisheries in general. The quantity of fish in the open fields will always be proportional to the total quantity found in the entire freshwater area of the locality. If fish are abundant in the rivers and canals a larger number will find their way into the fields. If, however, there is a scarcity of fish in the rivers there will be a corresponding scarcity in the fields also. From this it is correct to infer that the condition of field fisheries gives a more or less accurate idea of the state of fisheries in general for the particular locality under consideration. The statistics indicate that field fisheries have dwindled steadily since the introduction of engine drainage. In 1923 an area of 640 acres yielded 5,100 lbs. of fish, while from the same field only 1,500 lbs. of fish was obtained in 1932. Similarly an area of 40 acres yielded 720 lbs. of fish in 1925 and only 240 lbs. in 1933. The third table supports the same conclusion that is that the field fisheries of Kuttanad have dwindled to one-third of their original yield within a period of nearly ten years. The most important result of the reduction in supply was a slow and steady rise in price. In 1923, 100 lbs. of fish cost the wholesale dealer Rs. 1-12-3 while for the same quantity he had to pay about Rs. 4-9-0 in 1933. During a period of ten years the price of fish has more than doubled. The increase in price has been mainly determined not only by the diminishing supply but to a greater extent by the increased demand for the commodity. This slow and steady increase in price was at first advantageous to the owner of the fisheries, since he derived a slightly higher income per unit area. The annual income per unit area of 100 acres was Rs. 14-1-0 in 1923. It rose to Rs. 17-8-0 in 1928 and 1930, but from that time onwards the fall has been rapid and reached the low level of Rs. 9-13-6 in 1932.

The annual income from the field specified in the second table bears no relation to the annual income from the other two fields. In fact the annual income per unit area of the different fields shows considerable variation, depending chiefly on their situation in relation to rivers and other environmental advantages favourable to fisheries. However, from these statistical considerations it is evident that the fisheries have suffered to a grave extent owing to the intensive and injurious methods of fishing, which were stimulated by an increased demand and diminishing supply of fish.

We shall now consider some of the immediate causes which lead to the deterioration of the fisheries in general.

All methods of fishing operations carried on during the spawning season of fishes and all methods of capture which destroy the fry are detrimental to the future of the fisheries. In Travancore, as elsewhere in the greater part of British India freshwater fisheries are not protected by Legislative measures, hence indiscriminate fishing is carried on all the year round and this is mainly responsible for the steady diminution of the fisheries.

During the monsoon, when fields and channels are flooded many fishes pass upstream and others, normally inhabitants of hill-streams, descend to the plains for breeding. During this time they lose much of their natural timidity and seem only anxious to reach places suitable for depositing their spawn. The fry of many migratory fishes of the plains pass the first year in the hill-streams and descend to the plains only with the commencement of the succeeding year's monsoon. The appearance of these young migrant fishes and the spawn-bearing adults, when the monsoon bursts with its full force, is called in Malayalam *ootha elakkam.* In large shoals they find their way into the fields or rush up against the currents. This is the time when fish are caught in plenty. All conceivable methods are employed to catch them: fixed engines of every type are set up against the currents and cast nets are used in all possible ways. This means that out of millions of spawn-bearing adults and young which start on their hazardous journey only a few manage to reach their destination. They are netted by hundreds in rivers and canals, those that manage to escape, following the flow of water arrive at the partition bunds of paddy fields and here they are again netted or trapped. If any manage to escape to the smaller water courses their dangers only seem to increase.

We have described elsewhere the basket-work traps used in Travancore. They are constructed to prevent escape of even very small fish. Such traps and small-meshed nets, used during the migratory seasons of fishes are largely responsible for the destruction of large numbers of fry and young fish. If allowed to reach their destination they would in due time develop into large fish. Though some types of fry do not develop into edible forms, they are still of great importance, since they form the food of the larger and carnivorous species. Hence, whatever be the nature of the fry, their preservation, directly or indirectly tends to improve the condition of fisheries, but, owing to the lack of proper control, they are destroyed in enormous numbers year after year. The gravity of this wasteful destruction of fry can be easily comprehended from the simple mathematical calculation worked out by Dr. Day, which I have adapted in a slightly modified form to suit local conditions. Let us suppose that 670 tons of fry are annually destroyed and suppose we calculate the weight of each fry at one grain we find that the number of fry destroyed is about 8,650,000,000. Suppose half the number are destroyed by natural processes and the remaining fry develop into adults weighing one pound each, at the end of one year we would get 4,325,000,000 lbs. or roughly about two million tons of wholesome fish sufficient to feed a population of three million fish-eaters of mixed diet for more than three years. Though this calculation may not represent actual figures, still it is evident that the country is suffering a considerable loss. Apart from this wholesale destruction of fry during the monsoon, there are some methods of fishing which are equally injurious to the fisheries. In Kuttanad the practice of fixing small-meshed nets to the outer ends of drainage pipes, when water from the fields is pumped out prior to cultivation, is responsible for the destruction of large quantities of young fish and fry. The mesh of the nets used is so small that not even very small fish can escape.

Many countries interested in developing and maintaining the value of their fisheries have passed Legislative measures to prevent the capture of fish during the spawning and migrating season. In Travancore there are no such precautionary measures, and hence spawn-bearing fish are destroyed in plenty without restraint. Migration is one of the essential factors in the life-history of many freshwater fishes and as a general rule migratory types produce more eggs than non-migratory forms, as an offset against the dangers which beset them in the course of their development. If left unmolested and allowed to reach their spawning grounds and deposit their eggs, the young fish which may develop from them would yield a catch in the succeeding year, which will more than repay the previous year's loss.

Among the non-migratory forms *Ophiocephalus* and *Etroplus* are regarded as very good food. Both these fishes, being of shy and retiring habits, are not often obtained in ordinary cast nets. Hence fishermen with knowledge of their breeding habits easily catch them, as we have already described. It is evident that their methods of catching are ruinous to the fisheries. Either the fish are deprived of the chance to deposit their eggs, or the eggs are destroyed in the process of catching the parents. *Ophiocephalus striatus* which is commonly found in the plains, builds nests and both parents keep guard till the fry hatch out. When the fry begin to swim about they do so under the protection of the parents. The parents with their brood always keep close to the banks for protection, but this habit enables them to be easily detected and caught. When the parents are caught the fry scatter and are eaten up by other fish. Similarly the catching of prawns during the breeding season is responsible for the considerable reduction in supply during the last decade.

In the hillstream region trapping during the monsoon seasons and the poisoning of streams during summer are very injurious to the development of fisheries.

From this brief account the causes which are injurious to the development of freshwater fisheries in the State may be summed up as follows:—

1. The use of small-meshed nets.
2. The use of drain pipe nets called engine nets, or *madavala*.
3. The indiscriminate use of traps and other fixed engines and cast nets during breeding and migratory seasons.
4. Methods of fishing based on knowledge of the breeding habits of fish.
5. Poisoning and trapping in hillstreams.
6. Destruction of semi-aquatic plants along the banks of rivers and canals.

These methods of fishing affect the fisheries by:—(1) preventing adult fishes from depositing their eggs; (2) destroying the fry; (3) destroying the natural food, protection and environment of the fish.

How conspicuous the ill effects have been to consumers, to the fishermen and to the owners of fisheries is evident from the statistical conclusions given. The increase in price stimulated by a dwindling supply has made fish a rather costly commodity. But this increase in price has not enhanced the income of the fishermen or owners owing to the decimation of supply. If such conditions are to prevail unchecked for another decade, this country so rich in natural resources favourable to the development of freshwater fisheries, will become more or less completely denuded of fish and many varieties of edible fish once very abundant but scarce, will be on the road to extinction.

GENERAL CONSIDERATIONS.

According to the Census Report of 1931 the population of Travancore is 5,100,000. Nearly 82 per cent are non-vegetarians, who eat fish if they can obtain it. The remaining 18 per cent is formed of Nambudiri Brahmins, Vishnavite Tamils and some Nair families, who came under the influence of the Nambudiris during the days of the old Matriarchal system. The entire population of Christians, Muhammedans, Ezhavas, Channars, and the so-called depressed classes are fish-eaters. Hence there is always a good market for freshwater, marine and salted fish.

Fish constitutes a nitrogenous food comparable to meat in food value. It is much better and healthier than the flesh of half-starved country sheep or poultry. A large demand being beyond dispute we have to enquire whether the present supply is in any way adequate. Many educated men who live in coastal towns or in places within twenty miles from the coast have expressed themselves strongly against any need for developing the freshwater fisheries. It is true that along the sea coast, marine fish are landed in plenty during certain seasons, but the entire quantity must be sold in local markets or salted and dried. During certain months even salting becomes impossible and consequently large quantities have to be buried. Along the coast therefore fish is a very cheap commodity. For a very small fraction of an anna it is sometimes possible to get sufficient good fish to feed a family of ten. It is therefore quite unnecessary to contemplate any scheme to develop the freshwater fisheries on the coast, where there is always a regular supply of marine fish. The next question we have to ask is whether the abundant resources of the sea could supply the entire need of the fish-eating population of the State. It is more or less true that the quantity of marine fish landed would be sufficient to supply the greater part of the need, if the yield could be brought within easy reach of inland consumers. The greatest difficulty, which marine fisheries have to contend with is the exceedingly perishable nature of the commodity. In Western countries freezing, canning and curing and the organization of methods to ensure quick delivery to inland consumers, by the development of rapid and accurately co-ordinated means of transport have been adopted to get over this difficulty. But it must be emphasized that only fresh fish can be used as a satisfactory substitute for fresh meat. However, in India such organization of the industry does not exist and it is not possible to distribute marine fish beyond twenty miles from the coast. For this reason in the interior of the country people have to depend entirely on the freshwater fisheries for their daily supply.

Freshwater fishing is carried on all through the year in Kuttanad, but here the supply is hardly sufficient to meet even the local demand. In the hilly regions owing to the rugged nature of the river-beds and the extreme scarcity of fish, fishing is difficult and uneconomical except during the monsoon seasons. Hence the greater part of the State comprising a population, the majority of whom will eat fish if they can obtain it, is actually forced to subsist on a purely vegetarian diet, owing to the scarcity of fish.

The introduction of co-operative methods adopted to the needs of those engaged in marine fishing industry and the introduction of refrigeration in co-ordinated rail-road transport may perhaps be a remote possibility in India, but till such a time comes the easiest and the quickest way of supplying the needs of the people living in the interior, lies in the development of freshwater fisheries. The existing fisheries are not only plentiful but well distributed. The great system of rivers, lakes and canals with hardly any exception will hold large stocks if properly developed and controlled.

The freshwater fisheries of the State may be classified as follows:—

1. Perennial rivers of the plains;
2. Hill streams;
3. Canals;
4. Tanks and submerged paddy fields (the latter in Kuttanad only);
5. Natural lakes;
6. Artificial reservoirs.

All these without exception contain a rich variety of fishes which have already been enumerated. These fish can be classified under three headings as follows:—

1. Predaceous fish. *Wallago attu* in particular and many Siluroids in general are exceedingly predaceous and though *Wallago* is esteemed by many sections of the population, their preservation is injurious to fisheries.

2. Non-migratory forms, e.g. *Etroplus*, *Ophiocephalus*, *Mastacembelus* and *Brachirus orientalis*. All these except *Brachirus* are best suited for rearing in tanks.

3. Migratory forms. The different species of *Barbus* and *Labeo* come under this category. They will not breed under captivity, but many grow rapidly and are well fitted for stocking tanks. The fry can be captured from the rivers and transferred into suitable tanks. In Kuttanad, though stocking is practically impossible owing to the severity of the annual floods, in the higher regions this process will ensure a constant supply of fish. Dr. Day has calculated that migratory forms produce on an average about 500,000 eggs each, but owing to the destructive methods of fishing employed, a greater proportion of the fry perish before they reach maturity. However if reasonable measures are adopted to conserve them, they will multiply rapidly and provide plentiful catches in the succeeding years.

The methods of conservation followed in other countries are:—(1) Enforcing closed seasons; (2) Restricting the methods of catch; and (3) Maintaining fish sanctuaries.

Closed seasons are enforced in England during the migratory and breeding seasons of certain types of fish, to enable them to reach their spawning grounds unmolested. During these seasons it is an offence punishable with severe penalties, to set up fixed engines or even to fish with line and hook except for scientific purposes and even then only with the written sanction of the authorities. The difficulty of enforcing this law in India is obvious, but one cannot find a suitable alternative suggestion. In Travancore fishing is carried on vigorously during the breeding seasons and we have described elsewhere how the methods of fishing are responsible for the destruction of large quantities of eggs and young.

In the absence of closed seasons the maintenance of sanctuaries will afford the necessary protection for breeding fish. The success which has been achieved by the establishment of sanctuaries in the Punjab is well known to those interested in the development of fisheries. A number of sanctuaries are maintained on the tributary streams of the Beas and they are guarded by a staff of inspectors, who enlist as far as possible the co-operation of the villagers on a system of rewards. That the protection thus afforded has met with some measure of success is seen from the fact that these sanctuaries now teem with fish and there is conclusive evidence that the stock in the main river has noticeably increased. In Travancore fish sanctuaries can be very successfully developed, but before doing so it will be necessary to study the precise migratory and breeding habits of the important freshwater edible fish of the State.

A still easier and practicable method of improving the fisheries of the State is by restrictions on the methods of fishing.

The restrictions usually suggested are:—(1) Regulating the size of mesh of cast nets; (2) Preventing the use of traps and fixed engines during migratory and breeding seasons; and (3) Preventing the poisoning of streams.

Dr. Day was the first to suggest that the size of mesh must be regulated, but this suggestion has been criticised by a few who believe that cast net fishing is 'practically innocuous' to fisheries of any locality since only a very small proportion of the fish of that locality can be caught by this method, and further that the fish are naturally protected by the big and turbid waters of the floods. Even if this observation is true of large bodies of water so far as small rivers, canals and streams are concerned, we are convinced that the use of small-meshed nets is positively harmful, particularly in Travancore, where it is a common practice to use very small-meshed nets as *fixed engines*. By this process even small fry are filtered out. The system of licensing nets has been introduced in the State; if this could be extended to encompass freshwater fisheries as well, and if the licensing fees were considerably increased in the case of small-meshed nets, it would effectively discourage the use of such nets in due time.

There has been a considerable outcry against the use of traps and fixed engines, and Dr. Day, in his work on the freshwater fish and fisheries of India, pointed out the serious consequences of this practice. The millions of small fry which are slaughtered in these traps and sieve-like fixed engines if allowed to escape and mature, in due time would grow to sizes varying from one pound to twenty pounds or more. For this reason he suggested that the method be made illegal. On the other hand the report on the freshwater fisheries of the United Provinces, maintains that traps are positively uninjurious to the fisheries of any locality as they capture only small and unimportant types which do not develop to any size. It is generally believed that experience and the accumulation of scientific data always acts as a check to the exuberance of imagination and the tendency to jump at conclusions. The observations in the United Provinces fisheries report are based on inadequate information and uncertain analysis of a 'number of catches'. In such matters one would hesitate to draw any general conclusions even after regular and systematic analysis of a few months' catch. Two years before the publication of this report Dr. Hora published an account of the Fish and Fisheries of Manipur and he definitely stated that by the use of traps large quantities of fish are caught. In Travancore trap-fishing is well developed and traps of different sizes are prepared to catch both small and large fish. In the large traps which are set up along the course of the river Manimala and in almost all the hill-streams, plenty of large fish are caught while the smaller traps used in the plains are mainly for small fish, including fry and the young of *Ophiocephalus*, *Barbus*, *Etroplus*, Siluroids and young prawns. These traps, whatever their size, are set up in bunds, which are specially constructed across rivers and water-courses. The flow of water is thus checked and diverted into the traps, through which it is sieved out. In this process fish have no means of escape. Only a few, such as *Labeo* and *Ophiocephalus*, are able to jump over the bunds into the streams below.

In spite of this overwhelming evidence against the practice of trap-fishing, suppose for a moment we agree with the observations of the United Provinces Fisheries Report, that only small and unimportant fish are obtained in traps—though we fail to see the reason why under such unprofitable conditions the fishermen should persist in setting up traps—still the fact remains that small and unimportant fish are the natural food of the larger and useful ones and their capture indirectly tends to ruin the value of fisheries by destroying the food of the larger types. With all these facts before us we see no reason for hesitating to agree with the conclusions of Dr. Day that trap-fishing is positively harmful to the development of fisheries and therefore forceful measures should be adopted for its discontinuance.

In this short account we have attempted to bring into prominence some of the destructive methods of fishing, which are threatening to depopulate the freshwater fisheries of the State, but we have not ventured to suggest any positive measures which will overcome these defects and restore the fisheries to their normal flourishing state, since such a task mainly rests with the Fishery administration of the Government and is beyond the scope of a paper of this type. However in a general way we can conclude that if the wasteful and destructive methods of fishing which are now widely and indiscriminately practised in the country are discouraged by the enforcement of suitable legislative measures or regulations, the freshwater fisheries of the country will once more revive and afford a new source of revenue to the State and plenty of wholesome and cheap food of high nutritive value to the people living in the interior beyond the reach of Marine fish markets.

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CUCKOO PROBLEMS.

BY

T. R. LIVESEY.

(WITH A COMMENT BY E. C. STUART BAKER).

(*With 4 plates*).

The parasitic cuckoos set a whole series of exciting problems to the naturalist—and especially to the oologist. This note is written in the hopes that it may induce members of the Society to record their personal opinions and observations on a subject of peculiar interest.

1. What exactly is the particular significance of the hawk-like appearance of the Common Cuckoo (*Cuculus canorus*), with its pointed wings and long tail—and especially the barred lower-plumage, that recalls the lower plumage of the sparrow-hawk? Is it mimicry with advantage?

To us the cuckoo certainly resembles a hawk of the sparrow-hawk type, but that is not to say that birds see such a resemblance. Birds are especially clever in their recognition of the different species of the birds of prey—their lives depend upon it.

I have not noticed that birds are frightened of the cuckoo—although they show an excited interest generally in cuckoos. Nor have I seen any combination between the male and the female cuckoos at the time the hen cuckoo deposits her egg which would suggest that their hawk-like appearance is in any way brought into play to distract, or frighten, the intended fosterer. Species that habitually foster the cuckoo seem to be attracted by the cuckoo, and I have seen the Burmese Stone-Chat—*Saxicola c. burmanica*—(the commonest fosterer of the cuckoo in the Shan States) constantly seek out the cuckoo and sit close to it in apparent excitement and interest. I have seen these chats sit close to the cuckoo right out in the open at the top of a bare bamboo for a considerable time and in no way, it seemed, were they frightened by the presence of the cuckoo, preening their feathers from time to time.

Further observations of a like kind confirm my belief that birds are not frightened of the cuckoo, and therefore, I am not inclined to think that cuckoos appear to them at all hawk-like.

Then if the barring of the lower-plumage is supposed to be in mimicry of the sparrow-hawk—what does the barring on the lower-plumage of the small cuckoos, like the Bay-banded Cuckoo (*Penthoceryx*) mimic? There is no such small hawk to mimic.

Light dawned upon me—so I thought, quite recently in this connection. I was sitting in a hide waiting to photograph a pipit feeding a fledgling Khasia Hills cuckoo (*C. c. bakeri*). Whenever the young cuckoo got frightened, as it did from time to time, it reared itself up and puffed up its crown feathers, and began to

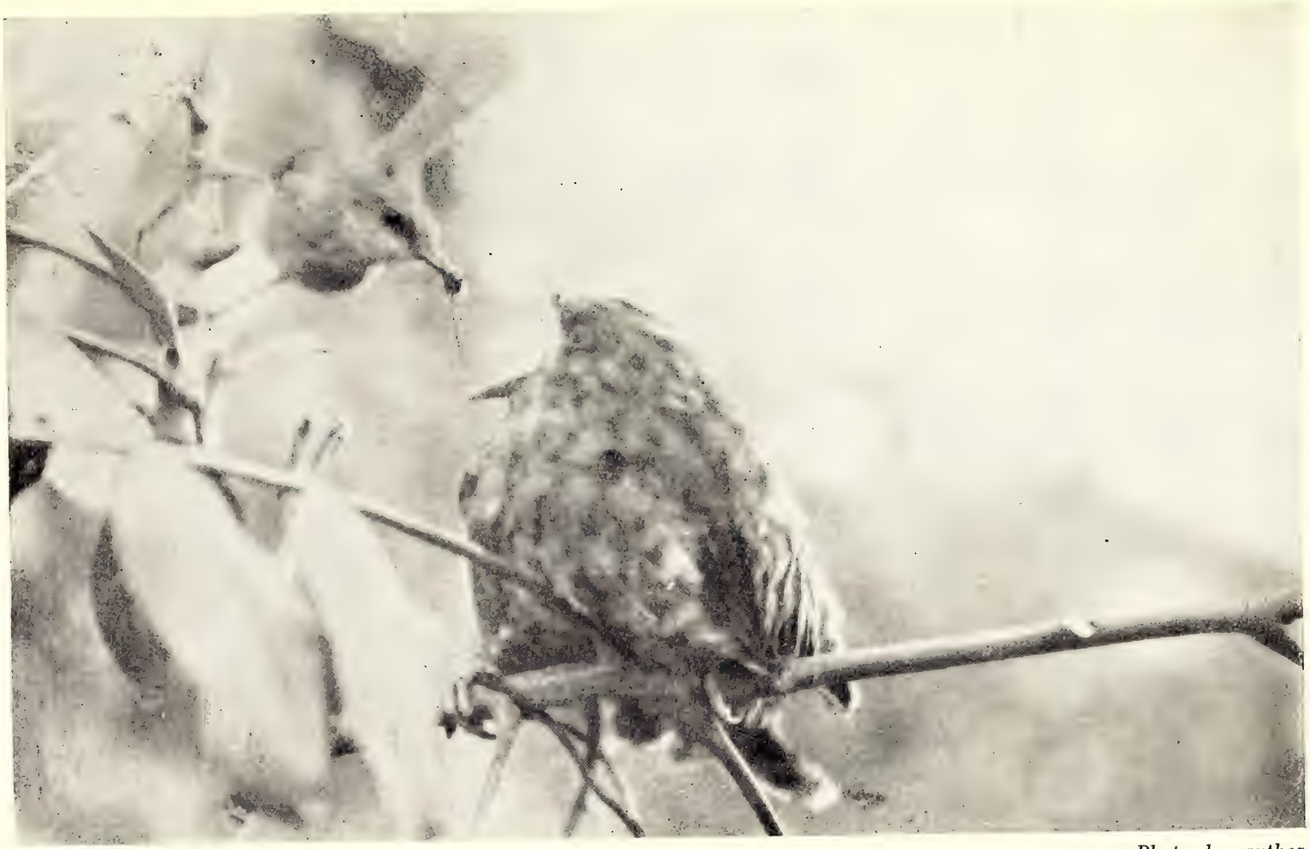

Photo by author.

'Please'

Baby Burmese Plaintive Cuckoo being fed by its diminutive foster-mother—a Franklin's Wren-Warbler.

turn about like a wryneck. The resemblance to the wryneck was so striking that I at once saw—so I think—the special significance of the barred lower-plumage. The young cuckoo had become a snake! The resemblance of the barred lower-parts to the ventral scales of a snake was most striking and the resemblance to a snake was still further emphasised when the young cuckoo opened its great orange gape. The barred upper-plumage was not unsnake-like, though here that might as well—if not better—be explained as protective colouration. Now the same snake-like effect may be seen in the case of the young of the smaller cuckoos like the Plaintive Cuckoo to which such a resemblance would be of equal value in scaring off enemies, such as wandering dogs, etc. (pariah dogs here regularly hunt the fields for young birds).

If this is then the explanation of the barred plumage of the cuckoos when fledglings—why does it persist into the adult plumage? And again, why the hawk-like wings and tail?

The barred plumage would naturally tend to persist in the adult plumage, unless there were reasons why it should be eliminated. Perhaps there are no such reasons for elimination—and again, it may persist by reason of aesthetic selection—it may well be admired and desired.

The Common Cuckoo loses the barring on the upper-plumage when adult. What does that mean? I can only suggest that it is lost as it is not admired—that it is not distinctive enough—and that the plain coloured plumage is preferred. But I confess the weakness of my remark. As to the long wings and tail—perhaps the roving, promiscuous habits of the cuckoos, and their migrations, demand a little speed and stream-lining.

2. Do the fosterers seek to defeat the cuckoo in her intention to victimise them—or do they seek to attract her to deposit her egg in their nest? One thing is certain, and that is that the the fosterers are *not indifferent* to the presence of the cuckoo—especially if they have a nest in the vicinity. I have noticed that whenever a cuckoo perches on the top of a high bamboo clump near my house, as one frequently does—it is almost sure to attract the attention of the nearest pair of stone-chats. These little birds are not in the habit—especially the female bird—of sitting on such a high and exposed position—yet if the cuckoo is up there they invariably fly up to it in some excitement and interest. They seem to flirt with the cuckoo, and flutter about it—first on one side and then on the other. Meanwhile the cuckoo has got a stupid, stuck look on its face, and keeps for a long time in this dazed and mesmerized state. What does it all mean?

I have seen a cock chat sit for a long time within two feet of a cuckoo on a single and exposed telegraph wire. Certainly it was in no way afraid of the cuckoo.

Why is this interest shown in the cuckoo? If the chats wished to conceal their nest from the cuckoo they would surely lie low and not advertise their presence. Again, some cuckoos were this year constantly feeding on some bare ground by my house—flopping down every now and again from the nearby fence to pick up something that they were eating. The chats were always in attendance upon them and in an excited state. Other birds did not seem interested.

Once, when the cuckoo was on its high perch on the bamboo top with a chat alongside, the chat suddenly flew off in a dip to some dead ground some forty yards beyond the bamboo clump. It was the hen chat. When I searched the locality later on I found her nest there with hard-set eggs in it. The cuckoo did not deposit in that nest—probably because the eggs were hard-set —but it appeared to me that the chat had clearly *shown its nest* to the cuckoo. They may have actually reared one themselves in a previous year.

As human beings we are over-inclined to attribute our own human feelings to animals—we think that the fosterers would resent being imposed upon, and so we are too inclined to believe that they seek to cheat the cuckoo in her intentions.

Cuckoos seem to find very easily every nest of the species they victimise—the most cunningly-hidden nest does not escape them. It is true that they sit and watch the fosterers for long periods with the utmost patience—but do the fosterers help them in their quest? It seems to me very probable that some do. If this is true then the cuckoo does not resemble a hawk in their eyes.

3. How does the cuckoo deposit her egg in the nest of the fosterer? This is perhaps the most exciting problem the cuckoo sets us, and which every ornithologist hopes to discover.

Mr. Edgar Chance in his *Cuckoo's Secret*, published thirteen years ago, showed the systematic way of studying the habits of the cuckoo, and by his photographs proved that the Cuckoo in England when desirous of depositing her egg in the open nest of the Meadow Pipit actually sits on the nest to lay into it. He was careful not to generalise from his observations and attribute to cuckoos this habit when victimising other fosterers—other species—in other places.

He had the cuckoo filmed and photographed *actually sitting on the nest.* I have been completely out of touch with Europe and all publications so that I do not know what further discoveries have been made and proved to Science in this matter—but I believe that nothing further has been proved. The crux of the problem now is not how the cuckoo deposits her egg in an open cup-shaped nest easy of access—like that of an English meadow pipit, but how she deposits her egg in a nest in which she cannot sit by reason of its having too small an entrance to admit her body—as in the case of a wren's nest (in which cuckoo's eggs have been found), or by reason of the nest being situated in a narrow place into which she could not possibly squeeze herself to sit on the nest. How the cuckoo dealt with such a problem was one of the problems he did not solve.

Now Mr. Chance—in spite of his name—studied the cuckoo with such careful method and with such system that he could predict in which pipit's nest the cuckoo would deposit on any particular day—and approximately at what hour. This is how he managed to get his photos taken. I wrote to him many years ago suggesting that he might solve the problem of how exactly the cuckoo

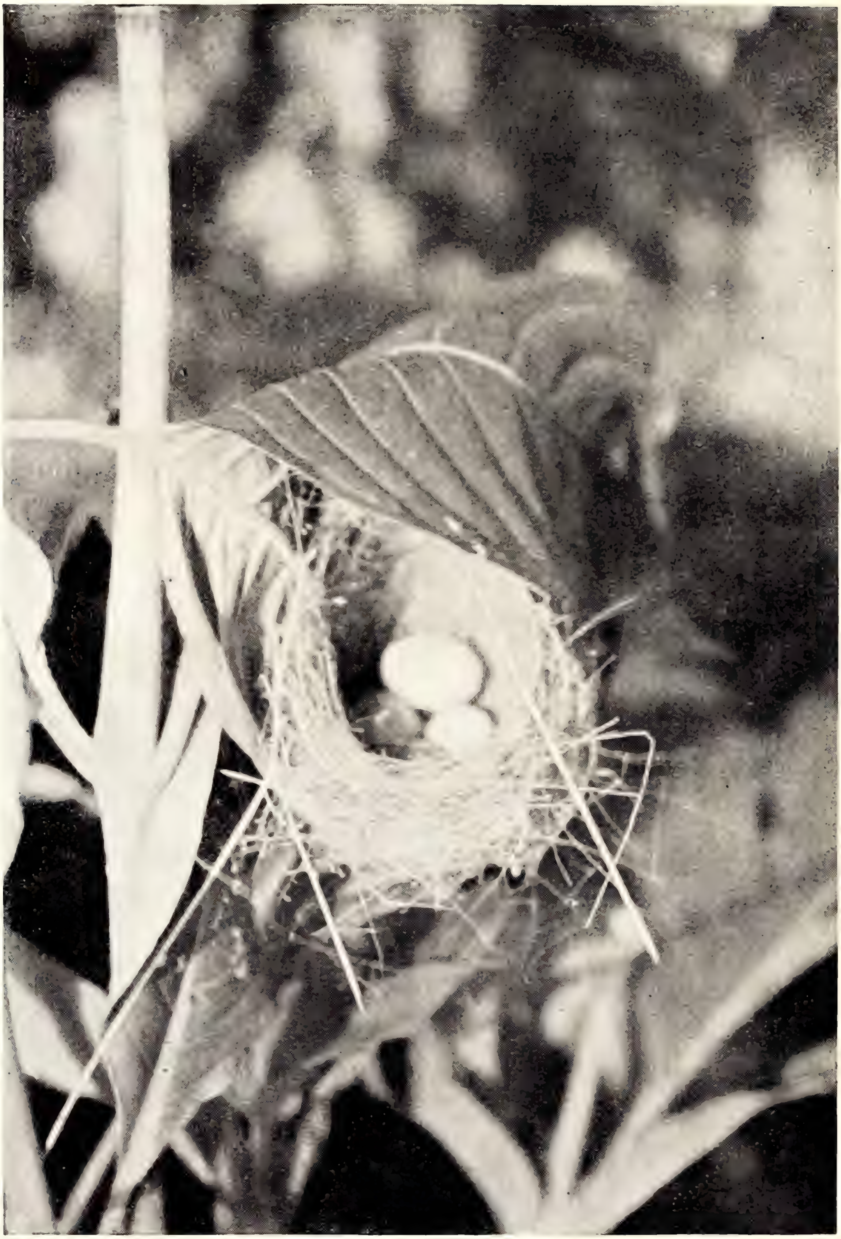

Photo by author.

Sewn into a single living leaf, a nest of Franklin's Wren-Warbler containing an egg of the Burmese Plaintive Cuckoo.

deposits her egg in an inaccessible nest by simply placing a small basket contrivance securely over the open pipit's nest so as to convert it into a domed nest and one into which the cuckoo could not sit and lay directly. Or, he could have obtained the same result by the placing of stones round the nest. He might then have seen how the cuckoo met the problem set her—one she finds very commonly in Nature.

But as far as I know he did not do so—nor anyone after him. This problem of how the cuckoo gets her egg into *inaccessible* nests is very much in evidence in a country like Burma, where, in the Shan States the commonest fosterer of the Cuckoo is the little Burmese Stone Chat which makes a nest generally in some crevice—or under a clod of earth—where a cuckoo could never enter to sit on the nest. I judge these nests by trying to put my hand (a small hand) into them and take out a chat's egg. If I am unable to do so then I conclude that the cuckoo with her long tail is also unable to get in. I should say that about 70 per cent of these chat's nests are inaccessible, judged by this standard.

A very good example of such an inaccessible nest was one I found in a section of bamboo lying out on open ground. This photo was published in the Society's *Journal*, vol. xxxvi, No. 4 of December 15, 1933.

It may be asked why I did not myself sit up over such nests and solve the problem. I am sensible to the reproach, but there are great difficulties in the East to contend with, and it is very difficult to find all the nests of the fosterers in any given area—besides I was ill when the best opportunities offered.

A point that is worth mentioning in regard to these inaccessible chats' nests is that many of them are situated—in fact most are—under clods of earth in ploughed fields, and when the chats lay in April and May the earth is parched and dry and of a crumbly nature so that the least disturbance of the clod brings it down on to the eggs. Any attempt on the part of a cuckoo to get in under the clod would certainly, with her long tail, cause a falling of earth on the chat's eggs, and subsequent desertion.

In a nest I took this year it was quite impossible to get the cuckoo's egg out with the hand—even using two fingers for the purpose—and I had to carefully poke my handkerchief in with a stick over the eggs to protect them from being broken by the earth that would fall when the place was opened out.

The Little Plaintive Cuckoo must find the same difficulty in getting her egg into a Franklin's Wren Warbler's (*F. gracilis*) nest as *C. c. bakeri* does in getting hers into inaccessible chats' nests.

Until the exact way these cuckoos get their eggs in to such inaccessible nests is known to Science—we cannot claim to have discovered the whole of the cuckoo's secret.

There is one more point to consider. Sometimes one finds a cuckoo's egg lying just outside a chat's nest. In that case it would appear that either the chat has kicked it out of its nest—an impossibility in my opinion—or that the cuckoo placed it there—either by laying it there—or by putting it there in her bill. Now, in 1933, I found here three cuckoo's eggs in the same vicinity at short intervals of time which were all found lying outside the chats' nests. These three cuckoos' eggs were obviously the product of one bird—and being small eggs I suspected them to have been laid by a young bird. The chats' nests in these three instances presented no particular difficulty for the cuckoo to deposit in although all were of the inaccessible type. The eggs of this cuckoo were in all three cases lying about six inches outside the chats' nest—and were in no way damaged.

This year I found again a cuckoo's egg lying six inches outside an accessible chat's nest and I have a very attractive photograph of it.

From the above it would not appear that the chat is responsible for this *contretemps*—for the eggs were not damaged—were approximately always six inches outside the nest and in one case they were the three eggs of a certain individual cuckoo.

So therefore I conclude it was the cuckoo's doing and that she laid her eggs there.

Why was it left outside? Perhaps the hen chat sat tight and refused to get off her eggs—perhaps the cuckoo was disturbed and frightened, but from the fact that a particular cuckoo did it three or more times in one season points to an idiosyncrasy in that particular individual.

I think that it is certain that all these eggs were laid where they were found just outside the nest. Is this laying just outside the nest the preliminary action before putting the eggs in with the bill?

4. Does the male cuckoo assist the female in any way in depositing her egg?

As the cock cuckoo can be distinguished by his call note *cuck-koo* that makes observation easier than it might be. They are in the habit of perching on some high tree or bamboo clump affording a good look-out, and seem to spend most of the day thus—going from one prominent tree to another, chasing rival male or female cuckoos. Very little time seems to be spent in feeding. What is the meaning of these long waits in the tree tops? I think a good part of the time of the male bird is devoted to a close observation of the surrounding fields and open ground for fosterers' nests, and that when located, it shows them to the female cuckoo to win her favours. I saw a male (calling) cuckoo fly down to a chat's nest which was in an exceptionally deep hole in the ground—after a few seconds it flew away. There were eggs in the chat's nest—slightly incubated. What was its object in visiting this chat's nest? Not to eat the eggs. It never touched them. No cuckoo's egg was deposited in this nest subsequently—which rather spoils my story—still I think that it found this nest in order to show it to its mate. What other object could the bird have had? It was a most cunningly-hidden chat's nest. That no cuckoo's egg was deposited in it may be accounetd for by the fact that the eggs were incubated, and the nest about 15 inches down in a crack in the ground, What more natural than that the male cuckoo should assist its mate in the finding of fosterer's nests?

5. Why do cuckoos remove eggs from nests sometimes?

It seems to be the rule for cuckoos to remove an egg of the fosterers' when depositing their own, and Mr. Chance saw them remove the fosterer's egg first, and then sit on the nest to lay, holding the fosterer's egg in the bill meanwhile. Such removals are, we suppose, to make room for the cuckoo's egg, and that is a reasonable supposition. But there is another aspect to this removal of eggs, for cuckoos often remove a single egg from a nest and never deposit one of their own in its place. Why?—I think it is to test the state of incubation of the eggs—to see if they are fresh enough for depositing their own egg among them.

It does not appear to be for the purpose of eating the eggs —although the single egg taken is undoubtedly eaten by the cuckoo. If that was their reason they would return to such nests and eat the whole lot of eggs (these chats lay 5-6 eggs). I have never observed more than the one egg being taken. The year before last, at about dusk, I saw a cuckoo glide down to a chat's nest in a ploughed field. After a moment at the nest it flew up and towards me, passing straight across my front at 20 yards distance, clearly silhouetted against the evening sky. It had an egg in its bill. It had no egg in its bill when it flew down to the chat's nest. It flew up on to the top of a bamboo close to me. When I had got my field-glasses on to it the egg was gone. I searched under the bamboos but found no broken egg and so I concluded that the cuckoo had eaten it.

Now these chat's eggs were very hard-set. Next day they hatched. No cuckoo's egg was deposited among them.

What was the cuckoo's object in taking one egg from this nest? Not to eat it—for the cuckoo would have then eaten the lot at the visit it made to the nest—or returned later and finished them. I think it was to test the state of incubation of the chat's eggs. The cuckoo found them hard-set and unsuitable and so did not deposit its egg among them. Eating the eggs was just a convenient way of disposing of it.

Single eggs are often thus missed from a nest. Hunting for cuckoos' eggs, one marks down all the chats' nests one can find and then visits them from time to time, and so such diminution in the number of eggs in one or another nest is often noted.

A curious incident happened ten yards in front of my window this year. There was a Blyth's pipit's nest there under a clod of earth and on the morning in question there were two eggs in it on the point of hatching and one young one just hatched. Suddenly a cuckoo came swooping down to it and after a scramble at the nest flew off with one of the eggs. I went to inspect the nest and found that the young one had been kicked out of the nest to a distance of about a yard—and in the nest there remained but one egg. I put the young one back. The nest was destroyed by dogs a few days later. The cuckoo must have known in this instance that the eggs were hard-set and unsuitable—yet it took one egg. I think it was just habit. It flew down, I suppose, with the intention of taking an egg—and did so. Although the eating of an egg is not, I think, the cuckoo's primary object yet no doubt they enjoy it.

I am inclined to think that both male and female cuckoos take eggs in this manner to test their stage of incubation. To know their state of incubation is most essential for them. Chats' nests are so often so tucked away in holes and crevices that the eggs are in comparative darkness and their condition may not be apparent to the cuckoo by merely looking at them.

We know more or less how the cuckoo watches the fosterer's nest being built and has her egg ready to deposit in it at the right time—and in such cases I do not think any egg is removed with the object of testing its incubation. The cuckoo knows well enough that they are quite fresh. Then, if an egg is removed, it is removed at the time of depositing in the nest—to make room for the cuckoo's egg—not to test the state of incubation.

I suspect that both male and female cuckoos are given to this egg-testing. That would be a reasonable supposition if we believe that the male assists in finding the nests. The testing being of course a part of the finding of suitable nests.

So it would appear to me that there are two aspects to this egg removal—one to make room for the cuckoo's egg—and secondly to test the state of incubation of the fosterer's eggs.

6. Why is the common cuckoo's egg so small?

I think that a reduction in size has been achieved for the purpose of adaptation to the small eggs of birds chosen to be fosterers—not as Mr. Chance does, that it is because the cuckoo has to retain her egg in waiting for a suitable moment—or day even—to lay. A clue is to be found among the other species of parasitic cuckoos. The Köel for instance lays a normally-sized egg though her difficulties in depositing it in the nests of crows may be greater than that of the Common Cuckoo, as there may be opposition from the crows.

If adaptation in colour in the egg why not in size too?

7. How is the adaptation in colouration—in ground colour and markings—of the cuckoo's egg to those of its fosterer brought about?

Even people who are scarcely at all interested in birds wonder at the mimicry of the parasite's egg.

One obvious theory is that natural selection working through desertion has brought about this adaptation—that cuckoos' eggs which contrasted too violently with the fosterers' have been frequently deserted through the ages, and so unadapted eggs and their might-have-been progeny eliminated—until well adapted eggs came slowly into being—slight individual variations in cuckoos' eggs determining whether they should be retained and incubated—or deserted by the chats.

I confess I do not like this theory at all. The more we know of wild animal life the more we see *design* and the more we appear as the simpletons! It is hard to think of mimicry taking place without guiding *desire* on the part of the animal that is to benefit by that mimicry. I prefer to see more intelligence in

Nature, and look elsewhere for a solution to this 'colourful proposition'. I know it is difficult and open to ridicule to suggest the inheritance of 'acquired characters', etc., but a biologist finds difficulty and ridicule an incentive to thought and observation. Let us consider this problem.

It is certain and to be seen that cuckoos have their eggs very well adapted to the eggs of special species of birds they victimise. Here in the Shan States, we see the *C. c. bakeri* parasitic on two species—the Burmese Stone Chat (*S. c. burmanica*) and the Dark-grey Bush Chat (*O. ferrea harringtoni*) (which lays pale blue immaculate eggs in Burma). The Stone Chat's eggs are a pale greenish-blue in ground colour handsomely and well marked with rusty red markings, which often tend to form a zone or a cap at the larger end. The Bush Chat's eggs are a delicate pale, immaculate blue. The cuckoos lay two types of eggs—one type rather like an English robin's egg—a pale yellowish-white in ground colour marked with light red which often zones the egg, to resemble the Stone Chat's eggs, and the second type is a pale blue, immaculate egg admirably adapted to the eggs of the Bush Chat. In this area there may be other types of adaptation but they are uncommon. (I suspect one type, adapted to the eggs of the Crested Bunting.) Although the red type eggs of the cuckoo parasitic on the Stone Chat are very like Stone Chat's eggs—they are larger, and never seem to show any bluish or greenish tint in their ground colour. And the pale blue immaculate eggs of the second type of cuckoo never seem to show the least signs of any markings.

I have noticed that where there are bush chats, the blue cuckoo's eggs are invariably deposited in their nests. But bush chats have become very scarce in the vicinity of Taunggyi in the South Shan States, due to the clearing away of light scrub jungle and the general flattening out of the countryside following 'civilization', so that blue-egg-laying cuckoos that still haunt the Taunggyi neighbourhood cannot find bush chats' nests in which to deposit. I myself have not seen a pair of bush chats this year here—although they were not uncommon here some ten years ago. Therefore *faute de mieux* the cuckoos are depositing their blue eggs in nests of the Stone Chat wherein they appear in violent contrast. But I have found none deserted on that account. I have found no cuckoo eggs of the red type in nests of the Bush Chat. I may say that stone chats are extremely common and bush chats generally far scarcer. There would be about 10-20 pairs of stone chats to one pair of bush chats—some proportion like that, in the Shan States; but I think the proportion of blue-egg-laying cuckoos to the red-laying type to be rather higher than might be suspected. I should say there is one blue-egg cuckoo to seven red-egg cuckoos. It is almost certain that the Bush Chat was a much commoner bird in these States many years ago—before the population of humans had so increased. They like wild, scattered scrub jungle, whereas the little Stone Chat is friendly to human beings and loves the open cultivated lands.

As might be expected then, we find a number of these blue cuckoo's eggs deposited in stone chats' nests instead of in the fosterer's to which they are adapted (bush chats). As the Stone Chat does not appear to mind the violent contrast (these pale blue eggs have a startling white appearance in a stone chat's nest) the blue-egg cuckoo continues on without any appreciable diminution in numbers, I think. If the *desertion theory* was here in working order we should find that these violently contrasting blue eggs were being frequently deserted and that in consequence the blue-egg cuckoos were diminishing. I do not think they are diminishing. In spite of no adaptation to the fosterers they are now choosing they seem to be as successful as the red-egg type of cuckoo. I have noticed no desertions.

How did these two types of egg, each so well adapted to the eggs of a particular host, reach their perfection of mimicry? What influences the colouring of the egg shell of the cuckoo's egg? When two cuckoos mate the male cannot of course influence in the slightest the colour, or size, of the egg that the female cuckoo lays as a result of their union. The yolk, white and the shell of the egg are entirely maternal products of the female cuckoo and are not derived from the fertilized ovum. But the young cuckoo born from their mating will inherit tendencies from both its parents. We can imagine a case in which the male cuckoo was born from a blue egg in a bush chat's nest laid by a female cuckoo fertilised by a male also born from a blue egg. Should such a male mate with a red-egg female, their offspring—a daughter for instance—should inherit the blue-egg laying quality from her father and the red-egg laying quality from her mother! What eggs will she lay when she becomes mature? It should be an egg of intermediate type between the two—say a blue egg with a few sparse red spots on it. But such eggs are not found. The eggs seem always to be true to their respective types, and that is perhaps a point in favour of Mr. Chance's contention that the blue-egg type cuckoos breed only with blue-egg females, and the red-egg type with the red-egg type, and so *direct* as it were a pure parasitism against their respective fosterers the Bush Chat and the Stone Chat.

And yet there are difficulties in such a belief. In such promiscuous birds as cuckoos appear to be, it would seem certain that the different types co-habit, and again, certain that their union would be fertile. In this consideration a further point comes out. If the male cuckoo assists the female in finding nests of the fosterer, in an alliance of two types, they would be at cross purposes, the blue-egg male showing bush chats' nests to the red-egg female who would desire but stone chats' nests!

That the types keep to themselves and do not interbreed may be worth considering. Or, could we believe that in the matter of egg-shell colouring the female is completely prepotent over the male influence. And in that case, the offspring would always follow the mother's habits and, if a daughter, deposit in the nests of the same fosterer that she was reared in, irrespective of her

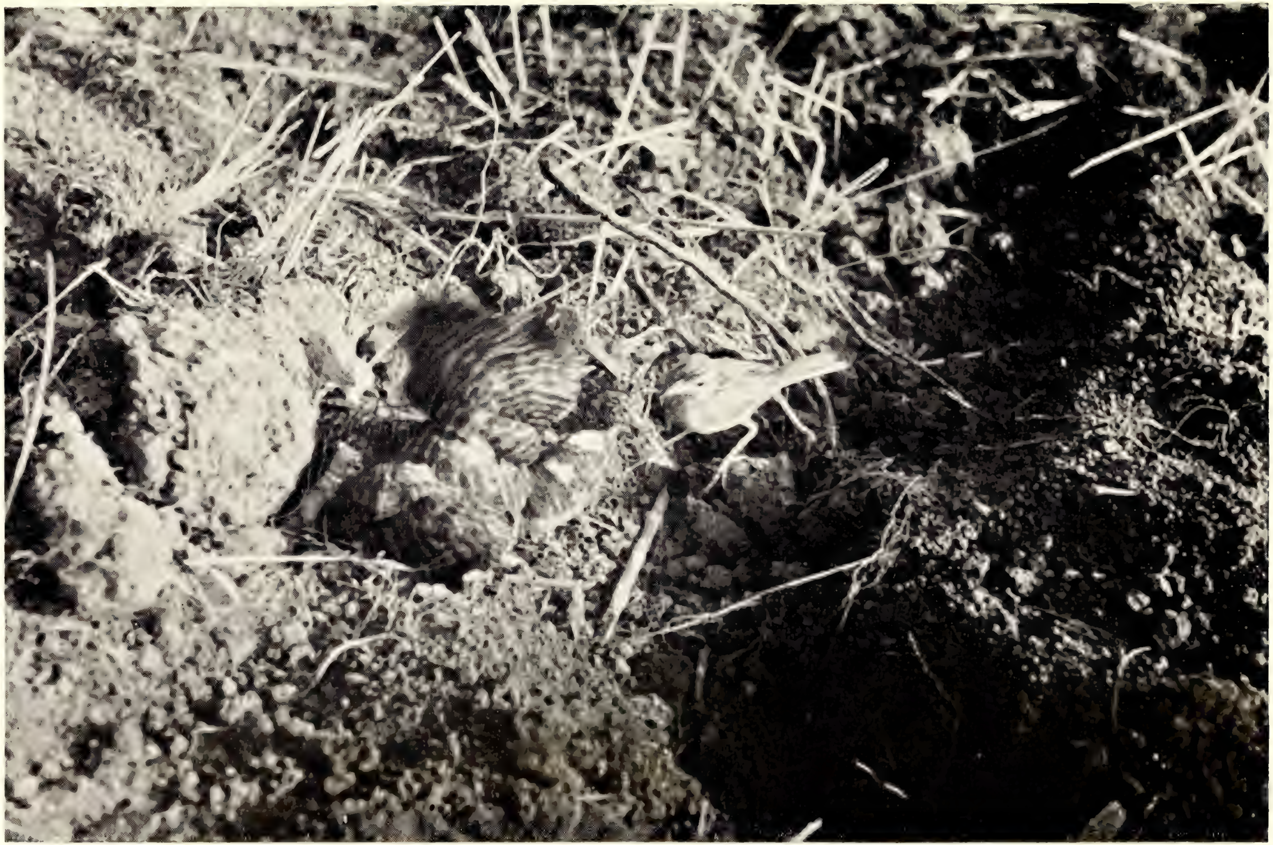

Photo by author.

Blyth's Pipit feeding young Khasia Hills Cuckoo. Note double white patch on the head of the young Cuckoo.

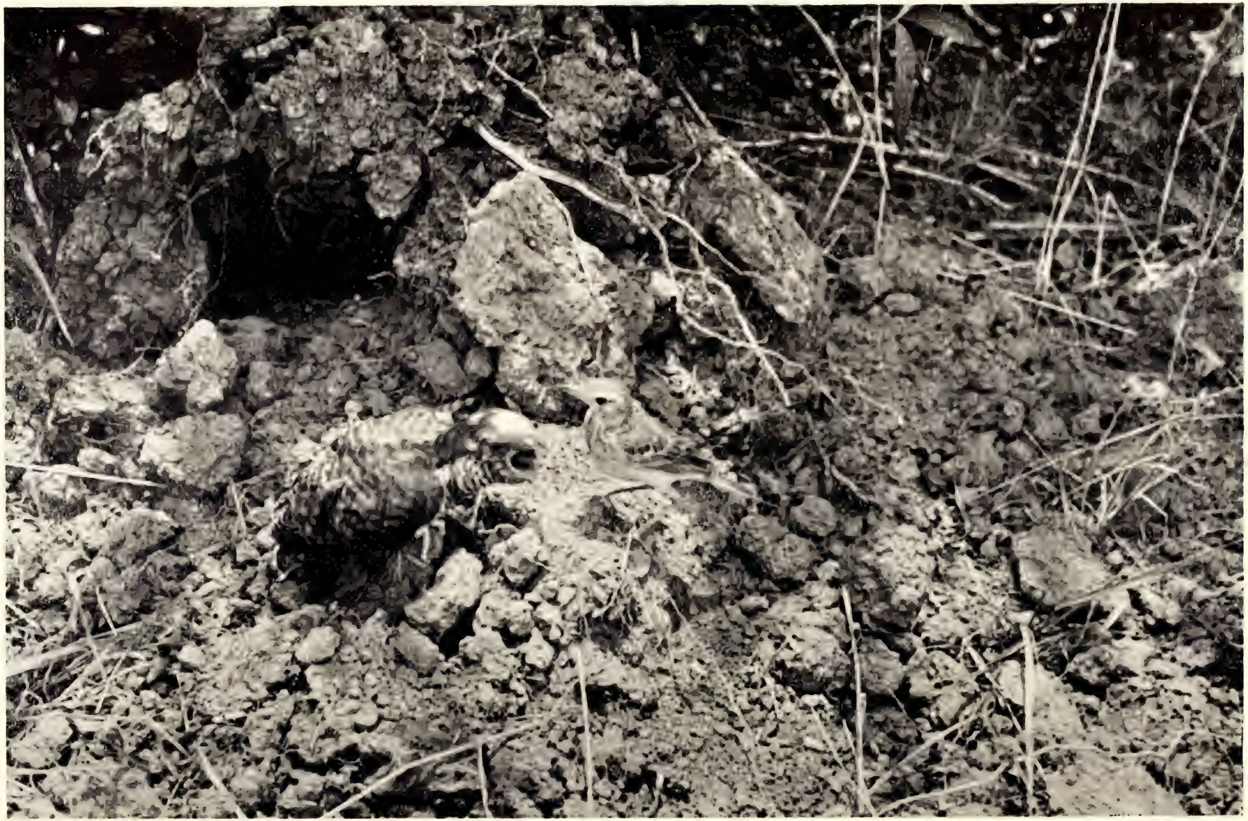

Photo by author.

Blyth's Pipit and young Khasia Hills Cuckoo.

father's upbringing. One feels inclined to leave all these complications to the judgment of the High Court!

And yet, as if this was not complicated enough, we get a further refinement of the problem. The Burmese Plaintive Cuckoo in the Shan States commonly lays two types of eggs—the one white with red markings, and the other bluish with red markings. Now these two types are not parasitic on different species of fosterers as in the case of *C. c. bakeri*—but they are parasitic *on the same species*—Franklin's Wren Warbler, which lays here two types of eggs—the one white with red spots, and the other bluish with red spots. And the cuckoos are particular to get the white egg into the white-egged *Franklinia*, and the blue egg into the blue-egged *Franklinia*! How indeed can we believe here that the two types of Plaintive Cuckoo do not interbreed?

That leads me to think that perhaps the maternally inherited tendencies are completely prepotent over the males in the matter of the egg-shell colouring and in the selection of the species to serve as fosterer. But the point at issue is being lost.

Let us consider first the case in which we have a pale blue, immaculate egg of *C. c. bakeri* in a nest of the Bush Chat. Here is an instance of perfect mimicry except that the cuckoo's egg is rather larger.

If this remarkable adaptation has been brought about by natural selection working through desertion—the *desertion theory*—it supposes that the cuckoo has taken no initiative in the changing of her egg through the generations it has taken to bring about the adaptation, but that the chat has—that the chats have ever been of a particularly discriminating nature and extremely critical of the egg deposited in their nest—deserting whenever the cuckoo's egg contrasted violently with their own. This implies that the intelligence shown has been entirely on the side of the chats. Somehow I feel this to be all wrong. I am inclined to attribute the adaptation rather to the cuckoo which is the one to benefit by that mimicry, rather than to the chats.

The *desertion theory* relies upon cuckoo's eggs showing slight variations. It has been commonly held that such slight variations have no particular significance—that they are little unaccountable 'jumps of Nature'. Now that does not appeal to me at all. I think a biologist should avoid such a 'jumpy' attitude of mind. I think he should say rather that he is unable to appreciate the meaning of such slight variations. Such slight variations—barely perceptible—are not—I prefer to think—haphazard 'jumps', but definite indications of tendencies we may—or may not—be able to appreciate which have their origin in the germ plasm.

If that is so, the slight variations of colour and markings in the cuckoo's eggs are not just unmeaning 'jumps'—occurring without purpose—signifying nothing in particular—but rather they are definite differences produced by that individual cuckoo, that have a meaning even if it is not given to us to see what that meaning is. That is to say, that *it is the cuckoo that is bringing about the change in her egg*—and not the chat. She is *directing*, and the chat's choice is subsidiary. After all is it not rather like an artist and his paintings? The variations in his painting—slight differences in tone and colour—nuances—may seem purposeless and without meaning to others who view the finished picture, but to the artist they are his very work and full of an intimate significance. If therefore you prefer to see a possible meaning and design in individual variations rather than none you will not favour the *desertion theory.*

Biologists have always ridiculed the idea that a bird could 'by taking thought' alter in any way its egg. If you mean during that bird's life-time, then I agree that the supposition is worthy of ridicule, though ill health and possibly unaccustomed food may give rise to abnormality in eggs in the life time of the individual. But if you suggest that 'by taking thought' a *desire* to a *particular* end is created within that individual, and that that *desire* to the same end is inherited by that individual's offspring, and again strengthened and transmitted to future generations, I do not see why the continued *desire* should not eventually begin to have a visible effect after the lapse of 10-100 generations or more.

Surely such *desire* is the main element in sexual selection—does not the very word 'selection' suggest a *desire*?

In the *desertion theory*, desire is shown when the chat refuses the cuckoo's egg. It does not desire to accept it—or, if you like, it desires to desert it. The transmission of acquired characters has given rise to much argument. But it is impossible to estimate the amount of desire that may be acquired within the life-time of the individual—and who shall say that some such desire acquired in an individual's life is not transmitted to the offspring? The original move in parasitism in cuckoos must have come from the cuckoo. A cuckoo's egg did not find its way by accident into another bird's nest. The cuckoo put it there—or in other words the cuckoo desired to put it there. The cuckoo then first showed desire—what is more likely than that such a desire should continue to play its part in the full evolution of cuckoo parasitism? Nature struggles persistently to its end.

I think that it has—that desire has been the chief factor—desire on the part of the cuckoo to imitate—in her evolution of complete mimicry. Natural selection working through desertion may have played some part too, but I cannot see it as having been a major factor in the mimicry.

I think that a bird can change the colour of its egg 'by taking thought'—if you give it long enough—say many generations.

The *desertion theory* demands a high percentage of desertions. I have never noticed many. I have found not more than about 3 per cent of nests containing cuckoo's eggs deserted. That is to say about the same percentage of deserted nests as one finds that do not contain cuckoo's eggs. Again those three deserted nests containing cuckoo's eggs may have not been deserted on account of the cuckoo's egg they contained at all—but to other causes such as cause birds to desert their nests—vermin or the passing of men and cattle—or an accident to the parent bird.

The problem is probably incapable of solution . . . but we are quite charmed to think about it. Exasperating to a man of exact science such problems must be—and to those of ordinary education who demand a reason—and only one reason for any perplexity—but full of fruitless delight to the biologist.

The Origin of Their Parasitism.

The cuckoos are classified into two groups, the parasitic and the non-parasitic. That classification is not necessarily a correct and natural one; it is only the best that mankind has been able to do so far. The entire classification of birds is more or less arbitrary, and probably very incorrect, for their natural descent cannot be made out when so many groups have become extinct in the long process of evolution. Besides the missing links, there are all the apparent affinities, that are not homologous, to confuse and obscure the zoologist who would attempt to draw up a genealogical tree for the *Aves*. Even within historical times, a number of species of birds have become extinct, so that a vast number of species must have been eliminated in the long ago of which there is now no record, not a trace.

If it is true that the parasitic and the non-parasitic cuckoos have been correctly classified together and associated, then it is interesting to speculate as to which of these two divisions is the older. Probably the non-parasitic are the older or of approximately the same period, for were they a more recent group it must be supposed that they were at one time parasitic and then have reverted to normal habits. Strong evidence would be necessary to convince one of that. Nature does not forgive—does not offer a second chance.

Perhaps cuckoo parasitism is of comparatively recent origin; and perhaps it arose independently in two, or more, groups of cuckoos—not in all its present forms from one stock.

It is more than doubtful if we shall ever be able to get an answer to the question as to how this extraordinary parasitism started, but that is only an incentive to the biologist!

As the simpler problems that the parasitic cuckoos set are slowly solved, this great fundamental question as to the origin of parasitism must loom out larger and larger to the enquiring mind. Or, it may be viewed as a comparatively simple problem—just how a habit started in a common group of birds! But the more it is considered the more formidable it seems, this question as to 'How did it start?'

The very nature of birds, with their soft plumage and light bones and habits of flight, and life above the earth, preclude the finding of their fossil remains in any useful quantities, so that their history seems irretrievably lost. There remains only their embryology to suggest past mysteries—but it is indeed difficult to read, and can scarcely help us to trace a habit, such as parasitism, that leaves no structural modification behind to identify it.

The mind must set out on a wild flight of fancy to dream of the birds of long ago, when the species of today were in the making, and the cuckoos about to enter on their great adventure . . . of parasitism.

Now it could never have been *chance* that started parasitism in the cuckoos. Chance seems to play hardly any part in Nature—we must look for *design* behind phenomena.

Birds never lay or deposit their eggs *by chance* in the nests of other birds. The few instances known in Nature of birds laying in other birds' nests are always deliberate and nearly always in the nests of the same, or closely allied, species.

Had the first cuckoo—had the first hundred thousand cuckoos—laid or deposited their eggs by chance in the nests of other birds *all the young cuckoos reared to maturity from those eggs, would, when the time came for them to reproduce their kind, have reverted to normal habits of nidification.* There would not have been born in them the quality of parasitism—they would have felt no urge to depart from the normal habit of making their own nest and hatching their own eggs.

We are then most certainly bound to suppose that parasitism did not originate by *chance.*

Had the cuckoos so utterly departed from the natural law as to deposit their eggs by chance in other birds' nests we see that their attempt at parasitism would never have survived the first generation.

We are then led to suppose that the cuckoos started their parasitism by *design*, by *desire.* They must be credited with some such powerful, and special impulse, to cause them to depart so far from the normal habits of nidification. This does not of course solve the problem of the origin of parasitism, but it is a step back in the history of parasitism—and one forward towards the insoluble.

Parasitism may have started in the long, long ago, by desire in a particular individual cuckoo—or in a pair of cuckoos, but it would seem more natural—less of chance—that the habit was evolved, more or less at the same time in the whole group of 'cuckoos' that were about to become parasitic. In other words that parasitism was not the freak, or chance, of a single bird, or pair of birds, departing from the normal but rather the culminating act brought about by an impulse or desire that had gradually developed in those species over many generations.

Had the parasitism started in a single bird, or in a pair only, the chances of the habit surviving would have been very slight—especially when the suitability of the fosterers had not as yet been tested and ascertained.

It is therefore reasonable to suppose that parasitism started on a wide front and over a large area by those particular species in which this urge—or desire to become parasitic had become so strong as to be ready for actual expression. It may too have originated independently in more than one species.

The next stage would be the placing of their eggs in the nests of other birds over a large area most probably. What were these eggs like? Were they of the primitive colour—white, or were they marked, or coloured, eggs peculiar to that species? Or had they even at this early stage a resemblance to the eggs of certain species of birds decided upon to act as fosterers? The latter idea may safely be discarded as it is generally believed that mimicry only results after considerable trial over ages during which it is gradually perfected. It could not well jump to perfection before being put to use.

It may be supposed then that the cuckoo's eggs were white (or any other colour you like) and were placed in the nests of either a certain species—or in nests of many different species—with special intention—or at random. But 'at random' suggests chance, and it is more probable that even at that early stage the cuckoos had marked down the particular species they intended to victimise. Or they may have placed their eggs in the nests of certain species especially chosen, and other eggs, *faute de mieux*, in other birds' nests, as they seem to do now, which is not quite the same as 'at random'.

It may be supposed then that the cuckoos at this stage—at the beginning of their adventure in parasitism—laid eggs that did not at all resemble the eggs of the birds they were about to try and dupe—for all birds lay eggs of a type peculiar to their particular species—and, also, that they laid eggs of a size normal for the size of their bodies.

Having given in to this *desire*, or urge, to be parasitic, and having actually placed their eggs in the nests of other birds, the next thing to consider is how the cuckoo's eggs became adapted eventually to those of the fosterers. If the first act of parasitism —the placing of their eggs in other birds' nests—was brought about by desire, what is more natural than to suppose that the ultimate perfection of parasitism—the mimicry—has followed also by reason of the same desire within the cuckoo—*that the mimicry has been slowly brought about by the cuckoo.* This does not preclude other factors from taking effect on adaptation—but they would seem to be of minor importance.

The first stage in the adpatation of a white egg to resemble, say, red, marked eggs of the fosterer would be supposedly the appearance of a single red mark on it, or a few red marks—there would certainly be no sudden jump to a perfect resemblance. Such changes and adaptations in Nature are believed to take place only gradually and over very long periods of time.

Now the first appearance of such insignificant markings would have no natural-selection value, and this makes the *desertion theory*—that resemblance has been brought about indirectly by the fosterer deserting eggs that contrasted violently with her own, difficult, if not impossible of acceptance. Thus we are led to believe that these first few markings on the cuckoo's white egg came into being by *desire* of the cuckoo. It is impossible to fix the exact origin of *desire* in any particular and former generation, it would be far too subtle and elusive a quality to be traced, but we may suppose it to have been long inherited and strengthened already—this desire to mimic and dupe—before being given visible effect to in this change of colour in the egg.

Given once the beginning of red markings the elaboration of them to resemble the fosterer's eggs, change in colour tone, and possibly size, would follow in due course towards a perfect mimicry by the continued inherent *desire* of the cuckoo to dupe.

It has been argued that assimilation is not necessary, and my own contention that cuckoos' eggs are accepted by the dupes—even when contrasting violently with their own eggs, points to there being no particular value in the mimicry.

Why then this elaborate mimicry that has taken such ages in becoming perfected, if it is to be eventually of no use?

I think Nature works to a given end with astonishing and elaborate care—with a wealth of detail—much of which appears to us to be superfluous. So, I think, the parasitic cuckoos, driven by the desire to completely dupe their victims, have perfected their mimicry *irrespective of what the small birds duped might think of it.* After all, how could the cuckoo know what the dupes would think of her (the cuckoo's) egg? She would not know. It would be best for her in her parasitism to take no chances but adapt her eggs to the chosen species of fosterer. She would complete her mimicry—whatever the dupes might think of it. This is what, I think, she has done.

I have a very strong conviction that birds have a wonderfully keen appreciation of *their own eggs* and little, or no appreciation, of any other eggs. They regard their own eggs in the light of their inherited 'unconscious memory'. Instinct gives them a full appreciation of their own eggs. With regard to other eggs, I think, they just recognize them as eggs—and nothing more. To attribute an appreciation of a bulbul's egg to a sparrow is to credit the latter with human reasoning.

In the case of the cuckoo, it is different since cuckoos have been studying their dupes' eggs over countless generations with the sole object of perfecting parasitism. Here is the exception—the cuckoo is the only bird that is interested in the eggs of certain other birds. She views them *with an inherited appreciation.* This is another argument against the *desertion theory*, as I feel you cannot attribute to the fosterer an appreciation of the cuckoo's egg, to do so is to attribute powers of human reasoning to the fosterer who has no inherited qualities to enable it to judge any eggs other than its own.

And now we get back to where we started from—the origin of parasitism!—the birth of the *desire.* It originated in the cuckoos presumably for the reason that it has originated in many other forms of life—the inherent urge, impulse, or desire of an organism to take advantage of any opening that occurs in Nature by which it may profit to advance itself in the struggle for existence. For an understanding of the struggle for existence and the dreadful suffering it entails to guilty and innocent alike, it is best to leap from Biology to . . . Buddhism—from this world . . . to the next.

There are two, further and significant facts for consideration that I omitted to mention previously, that would appear to support my opinion that the resemblance of the cuckoo's eggs to those of the chosen fosterer has come about by reason of forces—however mysterious and incalculable they may be—that act *within* the cuckoo, rather than by forces of an external Natural Selection such as the *desertion theory* demands—a selection I consider unnatural—rather than 'natural'—since it tends to the disadvantage of the selector—the fosterer bringing about its own ruin.

The first, is the fact that the eggs of any particular, individual hen cuckoo are marked in such a particular manner, and are of such a particular character, that they are at once distinguishable and recognisible as the eggs of that particular hen cuckoo and no other.

Secondly, is the fact that the Drongo Cuckoo (*Surniculus lugubris*) resembles to such an extraordinary degree the King-Crow that it is generally accepted as a case of direct mimicry.

Now oologists agree that the marked eggs of any particular hen cuckoo bear such a close resemblance to each other that they can be safely assigned only to that particular, individual hen cuckoo. In some cases this particular and individual character of the eggs is so marked that it would appear to detract somewhat from the quality of their resemblance to the eggs of the fosterer. It would appear in such cases that the individual character of the eggs was of almost equal importance as their resemblance to those of the fosterer.

What is the significance of this marked individuality in the eggs of a particular hen cuckoo? It does not help in adaptation. On the contrary it tends to distinguish, and so interfere with complete adaptation. It cannot then be accounted for by the *desertion theory*—in other words it is not due to the fosterer. It must then be due to the cuckoo. It is natural to suppose that such an individual character to its eggs is required by that particular cuckoo for purposes of recognition—to distinguish its own particular eggs from those of any other bird. What other significance could it have but one of distinction? As a cuckoo does not place more than one of its eggs in any one nest, it is natural to suppose that it has a need to be able to distinguish and recognise its own eggs. Their individuality, their characteristic distinction from other eggs, enables the cuckoo to see at a glance whether it has already laid in a nest or not. In this connection it is interesting to note that as often two, or more, cuckoo's eggs are found in one nest—all laid by different individual cuckoos—it would appear that a cuckoo is not able to recognise another cuckoo's egg!

If the cuckoo has evolved *within itself*—over a great number of generations—those particular markings and colouration and type that give a distinguishing character to its eggs—is it not natural to suppose that the other remaining and incorporated character of her eggs—that tend to make them resemble those of the fosterer—are also derived from forces working within the cuckoo?

In the case of the Drongo Cuckoo there is said to be a remarkable resemblance in both form and colour to the King Crow. Is this not a case of mimicry? If so how has the mimicry arisen?

According to the *desertion theory*, I suppose, the likeness has been brought about by the King Crow!—to its own disadvantage and ruin!

I would rather think of it as a case of direct mimicry on the part of the cuckoo—over untold generations—working to its profit and advantage in its parasitism. If this is so—that a cuckoo can, over untold generations, so alter its whole form and colouration so as to mimic the King Crow—to help it to perfect its parasitism on the King Crow—why should not its egg also reach a similar mimicry from similar forces of desire acting in the same manner within the cuckoo to the perfection of parasitism?

If the mimicry of the bodily form is admitted why not too in the egg? Is not the egg a part of the body?

Undoubtedly many of the minor problems that the parasitic cuckoos set us will be solved in the near future by intensive observation on the part of an increasing number of naturalists, aided by photography, and possibly the keeping of various parasitic cuckoos in captivity. But will the major Cuckoo Problems ever be solved? Almost certainly not. Then why enter into a profitless speculation of the Unknown and Unknowable? Because it is Man's pleasure! and on the way lie the minor discoveries that lighten the path to understanding. Biological thought plunges far beyond the cold, ascertained facts of Science—nor will any intelligent man be denied the fantasy of thought into the Beyond.

Ornithology is not worthwhile unless it leads beyond mere measurements in millimetres of faded bird skins and the 'creation' of super-subspecies is the honour of colleagues.

The obejct in opening the subject of Cuckoo Problems is to stimulate the interests of naturalists, to their own advantage—to the enrichment of their life, and the solving of minor problems connected with cuckoo parasitism, and to provoke thought on the major and insoluble problems.

I regret that my name must be subscribed to what I have written. The interest in Ornithology is in *birds* and not in the people who write about them—and above all in *live birds*—the courtship and nidification and embryology of which form the secret and intimate and most significant part of their life.

Since writing the above I am very pleased to say that I have made quite a sensational discovery that should interest all naturalists—since it is a discovery of fact, and not opinion. Profiting by the invaluable information conveyed in Mr. Chance's book, *The Cuckoos' Secret*, I was able here at Taunggyi, on April 24, *to witness by design the cuckoo depositing its egg at an inaccessible nest of the Stone Chat.*

An account of this interesting act of parasitism will be published in the *Journal* shortly. I claim that it is the most important cuckoo discovery since Mr. Chance's work in 1921. I claim too that it is the first time that the act of parasitism has been observed at an inaccessible nest. Primitive man never had the advantage of Zeiss field glasses! The chat's nest was 5 yards distance from my hide, and with the glasses set at +5 the act took place in my very presence.

Comment by E. C. Stuart Baker.

The Editors of our *Journal* have asked me to write a commentary on the interesting paper written by Mr. Livesey on 'Cuckoo

Problems' and the origin of Cuckoo Parasitism. This is not an easy matter to do and it is rather like asking someone to answer one conundrum by setting another. So many of our cuckoo problems are still matters of personal opinion, while many people think they have solved these problems in perfectly different ways. Mr. Livesey has dealt, more or less, with many problems. He asks, 'Is the foster parent attracted to, or frightened by, the cuckoo? In what way, or ways, does the cuckoo deposit its egg in the nest? What interest does the male bird take in deposition, etc.? Why are the fosterer's eggs removed from the nest?' All these are questions of interest but it would take a volume to answer them so I restrict myself, for the present, mainly to an attempt to answer his theory as to the evolution of the cuckoo's egg, referring very briefly to the other problems.

Mr. Livesey and I have very different ideas as to how the adaptation of cuckoos' eggs to those of their foster-parents has been brought about. Either of us may be right or both of us may be wrong but, if between us we write something which will make other people think, then we have done something worth doing however much these same people may disagree with the conclusions we have arrived at.

I have had the pleasure of knowing Mr. Livesey now for many years and I know him to be an exceptionally keen and intelligent observer of all forms of Nature, so that anything that he makes up his mind to write about, will almost assuredly give us something worth, both reading and fully considering.

Mr. Livesey states, I think quite definitely, that he considers the main factor in the production of any cuckoo's egg of a type, colour or character similar to that of the foster-parent, in whose nest she deposits the egg, to be the cumulative effect of a *desire* to produce that particular colour of egg held by that particular line of cuckoos for many, it may be countless, generations. I do not think that Mr. Livesey wishes us to believe that *desire* is the sole factor for, in one of his letters to me on the same subject, he remarks, 'I do not say that environment does not assist the cuckoo in bringing her desire to perfection', while, perhaps also, he would admit certain other factors as having a greater or lesser degree of weight in the same direction.

Now my own belief is that the adaptation of the cuckoo's egg has been evolved by methods which are those relied on in the very crudest form of Darwin's theory of the survival of the fittest; i.e. I think it has been brought about by the gradual elimination of the eggs showing the greatest contrast to those of the fosterer and the hatching and rearing of those nearest in adaptation.

Unfortunately in an article of this nature and of the length, within the limits of which I must keep, it is impossible to deal very fully with such an intricate problem as that which has been set before us. I can, therefore, here only consider a few of the major points.

Let me first try to show what I consider to be the weak point in Mr. Livesey's theory. When we come to consider cuckoos' eggs we have to remember that there are a very vast number of cuckoos which produce a far vaster number of eggs, among which are many which have acquired what I term 'assimilation', either perfect or complete, advanced, incipient, or none at all. Obviously we may consider that those birds whose eggs have reached the most perfect stage in evolution are those which have been longest employed in attaining it, whilst those cuckoos, in which there is little or no evidence of assimilation between their own eggs and those of the foster-parent, are those which have been the latest to commence the acquirement of such assimilation.

When we study this particular point we find that the Common Cuckoo at the furthest point of its range north-west is that which appears to have reached the least perfect stage of evolution in its eggs. It is not until we study the oology of some of our more primitive sedentary cuckoos, such as those of the genus *Clamator*, that we can envisage an apparent finality of evolution. Amongst these various degrees of adaptation we find the most extraordinary evolution in colour, the results being often the same in genera widely separated. Thus, in what I have termed the perfect or complete stage we find certain cuckoos (*Clamator*, *Hierococcyx*) laying blue eggs which, even to the human eye, can hardly be distinguished from those of the birds which it normally 'cuckoos' (*Argya*, *Turdoides*, etc.). In another instance we find an almost equally final stage in which one species of cuckoo (*Hierococcyx sparveroides*) lays two types of egg, brown eggs which it deposits in the nests of birds which also lay brown eggs, or blue eggs which, in the same manner, it deposits in the nests of birds which also lay blue eggs.

Another similar dimorphic evolution is that shown by the Little Himalayan Cuckoo (*Cuculus himalayanus*) which lays red eggs in one area and in another white. In each of the above five instances the birds have attained a stage of evolution which, because it is sufficient for its purpose, may be termed either complete or perfect, yet these five colours have sufficed for all their purposes.

Must we then imagine that out of the many millions of cuckoos which have laid these eggs only the five colours, pale-blue, dark-blue, brown, red or white, were *desired* by these birds and that no one strain among such countless thousands *desired* grey, yellow, pink or any other particular colour? Such a reasoning seems to me weak, in that among so great a number of individuals we would hardly expect five colours to embrace all their desires.

We can, however, go even a little further than this. Let us consider the eggs of the Little Plaintive Cuckoo (*Cacomantis merulinus*). This is a bird which lays eggs which I have called polymorphic in their colouration. Over the greater part of the enormous area occupied by this little cuckoo from West India and Ceylon to Eastern China it lays two types of egg, white or pale blue, spotted or blotched with various shades of red and red-brown. Over this same extent of country the eggs are normally deposited in the nests of small warblers of the genera *Orthotomus*, *Franklinia*, *Suya*, *Cisticola*, etc., and, roughly speaking, these warblers lay similar white or blue eggs somewhat similarly marked.

If we take these areas one by one we find that further modifications of the cuckoos' eggs in character and markings have taken place and, in every instance, these modifications tend to increase the likeness between the eggs of the cuckoo and those of the foster-parent specially selected in that area. Thus in Hongkong, the Plaintive Cuckoo hardly ever places its egg in any other nest than that of the Tailor Bird (*Orthotomus*), while here also the great majority of Tailor Birds lay pale blue eggs with blotches. Accordingly the eggs of the cuckoo are nearly always pale blue and distinctly blotched, being so perfect in their assimilation that but for their larger size and different texture they would be most difficult to distinguish.

In Siam, much the same thing obtains but here the cuckoo also makes use of the nests of Franklin's Wren Warbler (*Franklinia*) which lays eggs which are generally speckled rather than blotched and we find that two strains of cuckoos have been evolved, of which one strain lays blotched blue eggs to place in the Tailor Bird's nests, while the second lays speckled blue or white eggs to place in those of Franklin's Wren Warbler.

Working through to India, its hills and plains from North to Central India, we find the blotched eggs gradually disappearing and the speckled eggs increasing in number and we also find that these latter are placed in the nests of *Suyas* and *Cisticolas* which also lay speckled eggs.

In the Nilgiris and in some other parts of Southern India this little cuckoo deposits its eggs in the nests of common Wren Warblers which lay deep blue eggs with dark blotches and we find also the astonishing fact that the cuckoo lays eggs which are deeper blue and more darkly blotched in this area than in any other part of its habitat and so here, too, assimilation has been advanced to suit special characteristics.

Finally we have an even more extraordinary result obtained by environment (as I believe it to be) in the Hyderabad district of the Deccan.

Generally speaking the Plaintive Cuckoo is a bird which prefers very wet, wet or moist climates and is not found in exceptionally dry areas of Sind, the Punjab and Rajputana, yet there is one dry area, that referred to above in the Deccan, in which this little cuckoo is exceptionally common. Here it has probably been driven by competition and by excessive cuckoo population from all the surrounding wetter areas and it has had, therefore, to find new foster-parents to take the place of those generally cuckolded in the less dry countries. The bird it has selected is the Little Ashy Wren Warbler (*Prinia socialis*) which is certainly the most common of the warblers round Hyderabad. This little bird, however, lays a brilliant dark red egg and necessity has evolved a red cuckoo's egg to agree with it.

Red eggs of this cuckoo are only to be found within a very small area, possibly some 50 miles across one way and very much less if measured from east to west. It is placed exclusively in nests of the Ashy Wren Warbler and never in the nests of those birds which the cuckoo usually victimises elsewhere. Surely here we have an instance in which the dominating factor seems to be the necessity of laying eggs suitable in colour to agree with that of the foster-parent and not a sudden desire of the cuckoo to lay a red egg.

If the Plaintive Cuckoo *desires* to lay a red egg in this one small area is it conceivable that in the many hundreds and thousands of square miles over which the species lays, no other individual bird has ever been seized with a similar desire? On the other hand we have in the gradual elimination of unsuitable eggs, apparently an obvious method by which the evolution of red eggs has been acquired. It seems to me that when the Plaintive Cuckoo was first forced to enter an area in which, *suo motu*, it would never have entered, it at once selected as prospective foster-parents, birds whose nests were very similar in appearance and suitability to those of its former foster-parents outside this area. Among the great number of eggs laid by these cuckoos it may have been that there were a certain number with a slight tinge of pink in them, such indeed as we sometimes see even in eggs deposited in other parts of India. Among these were some more pink than the rest and these, when placed alongside the eggs of the Ashy Wren Warbler contrasted less violently than the others. Some accordingly escaped destruction (in this case desertion) by the foster-parents. The birds hatched from these eggs would again lay eggs very similar to them and amongst the variations which we know to occur in all birds' eggs, a few again would be yet more decidedly pink than those of the preceding generation.

In each succeeding generation this process would continue, the reddest eggs in each escaping desertion in greater proportion than those not so well adopted, until, eventually, we should find that the suitable eggs predominated and the unsuitable ones were few and far between.

Professor K. Burnett who collected a wonderful series of eggs of this little cuckoo, most of which he very kindly handed over to me, told me that both the Little Cuckoo and the Ashy Wren Warbler were extraordinarily common round about Hyderabad. I asked him, accordingly, if he thought he could collect for me two series of eggs grading from those similar to the eggs of the same species of cuckoo laid outside the Hyderabad area up to the almost perfectly adapted red egg. Mr. Burnett went to immense trouble to obtain two such series, each containing about a dozen eggs graded as I had asked him. He, however, told me that while it was very easy to get the fully red eggs, it was very difficult to get those showing an approach to the normal outside types. Indeed, when I finally received these series I found that there was no egg which was quite identical with the normal type or types, although there were one or two which I could match with unusually coloured eggs laid by birds elsewhere. There is yet one other point in interest in connection with these red eggs of the Plaintive Cuckoo and that is the fact that spots, specks and blotches have almost entirely disappeared. The only markings ever seen are a very faint ring or zone of the deeper darker red round the larger end or, in a very few cases only, an indistinct mottling of red rather darker than the ground colour.

Now if we take in review all the various types of egg laid by the Plaintive Cuckoo over the whole of the area in which it occurs, we find the following action has taken place. Three main types of eggs have been evolved: (1) white, variously marked; (2) blue, equally variously marked; (3) red, unmarked or very slightly marked. As regards the ground colouration, whether white, blue or red, in each case this special colour is the same as that of the eggs of the bird in whose nests the cuckoo's eggs are deposited, and further, we find that not only has a definite colour been evolved but that especial characters of spots, specks and blotches have also been evolved to suit those particular types of eggs with which they have to compare.

If Mr. Livesey's theory of *desire* is correct then we must admit not only that cuckoos can by desire attain any colour in their eggs they wish for but that they can also, by desire, attain modification in depth of colour and variations in the character of the markings.

Surely Darwin's theory is easier to believe, easier to explain and more satisfactory in every way and from every point of view from which one can consider this marvellous adaptation.

I was once told by a clever, but rather young, biologist, who in his anxiety to criticize had not troubled to listen to what I had said, that it was high time pompous old gentlemen ceased to lay down the law on various scientific matters. On that occasion what I did say was that I hoped that no one would take any one law as governing the whole question of evolution but would remember that while many theories such as those of Mendel, Bateson and others were, or might, all be true, yet they were each but one factor in evolution, the results of which were modified by environment as a whole.

In the present instance I again make no assertion that I am right and all I do is put forward my evidence and leave it to the reader to determine, if he can, who is right and who is wrong.

Before I leave this problem of adaptation I must refer to three very important letters which seem to throw an extraordinary light on this question of evolution. They were written by gentlemen, all keen observers, and absolutely without any desire to prove or disprove any particular theory. The first letter was written to find out if anybody could give the reason why the Ashy Wren Warbler, which in previous years had been found to be much the most common bird in Hyderabad, had suddenly disappeared. The second letter was written asking if anybody could say what species the little cuckoo was which the writer had found laying freely in the nests of the Common Wren Warbler and in the nests of *Franklinia, although in every case the nests had been deserted.* Yet a third letter refers to two eggs of this little cuckoo, similar to eggs of the Jungle Wren Warbler laid in the nests of the Ashy Wren Warbler and promptly ejected and to other red eggs deposited in nests of the same warbler which were accepted, hatched and reared.

From these three letters we can perhaps conclude that some sudden disease having practically wiped out the Ashy Wren Warbler, the cuckoos, which had not been affected by the same disease, had to lay their eggs in some other birds' nests. Naturally those they selected were those of the birds which, outside the Hyderabad area, had previously generally provided their victims but, the red eggs of the cuckoos having been evolved to the practical exclusion of all other types, they were no longer suitable when contrasted with the eggs of the Common Wren Warbler or of *Franklinia* and, in consequence, the vast majority were deserted. It is probable, however, that among the red eggs which had now become the stable form, a few would be found less brilliantly red than the others and, these being less conspicuous, would be hatched, so that eventually we should have a process exactly reversing that which had occurred to produce the red eggs, until eventually these latter had been wiped out and we had a complete reversion to the white and blue spotted and blotched eggs laid by all other Plaintive Cuckoos. Here is a most interesting fact in the biology of the Plaintive Cuckoo which I sincerely trust some of our bird-loving residents around Hyderabad will do their best to confirm or refute.

Another cuckoo of which we at present do not know very much, the Himalayan Cuckoo, lays pure white eggs very faintly speckled with black or dark brown and, so far as we know, no other type is ever produced. The eggs are deposited in the nests of the numerous small warblers of the Western Himalayas, which also lay white eggs, either immaculate or faintly speckled as are those of the cuckoo. Here I suppose Mr. Livesey would say that the cuckoos do not lay white eggs because the others have been eliminated by the foster-parents but merely because in this particular species of cuckoo there are no individuals who ever desire to lay coloured eggs of any kind whatsoever.

It will be seen from what I have written above that if Mr. Livesey's theory of *desire* is the correct one we have the following points which must be conceded in addition to the primary one of desire. First, that having produced an egg not only of the colour but with markings of a certain character, the cuckoo then proceeds to select for the disposal of her eggs the nests of some other species of birds which lay very similar eggs. Here we seem to have a very striking contradiction. Admittedly most cuckoos do lay eggs which approach more or less closely in appearance to those of the foster-parents but if desire only on the part of the cuckoo is the factor causing this special colour and appearance, why is it that they so often are found in the nests of birds with similar eggs? Surely this would be utterly unnecessary unless the foster-parents had some power of discrimination and the cuckoo was afraid of her egg being unhatched or evicted. If she was so afraid, then the necessity for assimilation is at once apparent and if discrimination on the part of the fosterer and the necessity for elimination is admitted, we are at once back to the original position, that whatever the *desire* of the cuckoo may be, as to the production of any particular colour in its eggs, the eggs which are unsuitable will die out, while those which are more fitted for their purpose, i.e. assimilation, will continue, and we once more realise that the discrimination of the foster-parent is really the deciding factor. The only other alternative one can visualise is that throughout every cuckoo's life the most remarkable continuation of coincidences goes on—*quod est absurdum.*

Having reviewed the portion of Mr. Livesey's papers dealing with assimilation of cuckoo's eggs to those of the foster-parents and its cause, I can only touch very briefly on his other points. As regards the alleged hawklike appearance of the cuckoo, I can say very little. It is quite true that the cuckoo is often mobbed by small birds but this I think may well be not because it resembles a hawk but because it is a cuckoo, for there are other cuckoos, such as the birds of the genus *Clamator*, which bear no resemblance to hawks yet are frequently mobbed by small birds, especially during the breeding season.

The squamated appearance of the Common Cuckoo on its under plumage may quite possibly be explained as Mr. Livesey suggests. The idea is certainly ingenious.

Mr. Livesey's next theory to which he draws our attention is that so far from most birds being opposed to or intolerant of the cuckoo and its unpleasant habits, they are really only too proud to hatch and bring up a youngster so superior to their own. If, however, we examine carefully Mr. Livesey's reasons for thinking as he does, the behaviour of the bird as referred to by him might equally well show fear and anxiety rather than, as he suggests, fascination and attraction. Moreover, there is one little fact that Mr. Livesey does not allude to which is that very often small birds when they attack the cuckoo have been seen to pluck feathers from its back. One would not think that this would prove very attractive to the cuckoo.

Then Mr. Livesey goes on to discuss the method in which the cuckoo deposits the egg in the nest of the fosterer. To me this is not a very exciting problem though it is one which can only be dealt with at very great length, for it requires the accumulation of much evidence and cannot be dismissed as proved one way or the other. Here I would merely say that I am on the whole very much in agreement with Mr. Livesey. It is within my personal knowledge that eggs of cuckoos are frequently found in places where she could not possibly lay them directly into the nest yet Mr. Chance has proved to everybody's satisfaction, except that of Mr. Bunyard, that the cuckoo does, at all events sometimes, lay her eggs direct into the nest of the bird she victimises.

I should perhaps draw attention to a certain accepted fact as it is one of those which assist the theories of those who say that *all* cuckoos place their eggs in the nests in the manner described by Mr. Chance. This is the fact that the cuckoo is exceptionally supple and can for its size, get into smaller places than other birds of similar bulk. Thus I think Mr. Livesey's statement that he judges of the possibility or the reverse, of entrance by the cuckoo to the nest-hole by whether they are less than the width of his hand, cannot be relied on. At the same time Mr. Livesey has found many nests with their entrances far smaller even than this into which it is quite certain no cuckoo could have possibly entered.

Just as I was folding this paper up to go to the post I have received a most interesting letter from Mr. Livesey in which he writes: 'On the other hand my theory allows me to suppose that cuckoos finding that they have for some reason (such as extending migration) no suitable fosterers at hand to victimise, must adapt themselves to some other species (that has never yet been duped) or else try to continue unadapted. They would note red eggs of *Cettia* and recognise the need to imitate them, i.e. lay red eggs. Many cuckoos would begin to feel this urge' and then he goes on to say that with each succeeding generation this *urge* or desire would increase 'until after some generations the first red tinge in their eggs would appear as a visible expression of desire' to be repeated and added to until a fully red egg would express the fulfilled desire of countless generations.

Although I cannot, even now, agree that Mr. Livesey's theory of 'desire' or 'urge' is the dominating factor in the evolution of the cuckoo's egg, the above paragraph in a few lines adds so much to the scope of the theory as elaborated in his previous letters, that it is well worth repeating.

What a wonderful world this would be, or will be, if 'desire' or 'urge' to produce beautiful women and fine men could be given effect to for in every woman is an innate 'desire' or 'urge' in this direction.

THE ORNITHOLOGY OF TRAVANCORE AND COCHIN.

BY

SÁLIM ALI.

With Notes by HUGH WHISTLER, M.B.O.U.

PART V.

(*Continued from page* 514 *of this volume*).

FAMILY: MOTACILLIDÆ.

Motacilla alba dukhunensis Sykes. The Indian White Wagtail.

Specimens not procured by the Surveys but there are two in the Trivandrum Museum as follows: ♂ 22-12-03 Kayankolum Bar; ♂ 17-1-03 Alwaye.

Met with by the Cochin Survey only at Ernakulam, and there only a single bird on a grassy patch near Maharaja's College (3 January). It is a winter visitor, of course, and apparently very rare. Ferguson states that he collected specimens both at Peermade and the High Range and again in the low country at Alwaye in North Travancore, in January 1901 (*J.B.N.H.S.*, xv, 471). It has been recorded from Ceylon.

Ticehurst (*J.B.N.H.S.*, xxviii, 1089) gives the distinguishing character of the race *dukhunensis* as having the ear-coverts white at all seasons as against the next race *personata* which has them black at all seasons. This is usually an excellent clue to their differentiation in the field.

Motacilla alba personata Gould. The Masked Wagtail.

Not met with by the Surveys. There is a specimen in the Trivandrum Museum labelled ♂ 21-1-01 Moonar. Mr. Whistler comments on this as follows: 'According to the *Old Fauna* this wagtail was known to extend as far south as Belgaum, and I have not traced the original record on which the *New Fauna* (iii, 260) states that it occurs as far south as Travancore. The fact is, however, now proved by this specimen which was labelled by Ferguson *Motacilla alba*.'

Ferguson's statement under *dukhunensis* (supra) that he collected it on the High Range is obviously based on this specimen which Mr. Whistler points out is in reality *personata* wrongly labelled. That statement must therefore be referred to the Masked Wagtail.

It does not occur in Ceylon.

Motacilla maderaspatensis Gmelin. The Large Pied Wagtail.

Specimens collected: 173 ♂ 28-1-33 Sānthanpāra 3,500 ft.; 701 ♂ imm. 21-7-33, 751 ♂ 30-7-33 Beach, Trivandrum.

Elsewhere noted at: Mūnnār (5,000 ft.—High Range); Thattākād (200 ft.); Kottāyam (ca. S.L.); Kūmili (3,000 ft.); Kollātūpūzha (ca. 300 ft.); Velayāni Lake (Trivandrum Environs); Cape Comorin (ca. S.L.); Arāmboli (250 ft.); Kūriārkūtti (1,600 ft.—Annemalāi Hills); Wadakkāncheri (400 ft.); Karūpadanna and Ernakulam (ca. S.L.).

Colours of bare parts: Iris brown; bill, legs, feet and claws horny-black (slaty in immature No. 701); mouth slaty-pink in adult, pale flesh colour in immature.

[Other specimens examined:

B.N.H.S. Coll.: ♂ 21-2-94 Trivandrum; ♂ 16-12-91 Travancore; also a small Travancore series in the British Museum.

Measurements:

	Bill.	Wing.	Tail.	Tarsus.
5 ♂♂	19-20.5	98.5-99	98-105	26-27.5 mm.

This species has no races. The adult male is always pure black and white in colouration. The adult female has two phases (1) exactly like the adult male in colour, though of course slightly smaller in size; (2) differing from the adult male in having the black of the upper parts including the lesser and median wing coverts replaced by dark sooty-grey. This plumage is assumed at the second autumn, i.e. when the bird is about fifteen months old. The post-nuptial moult is complete and there appears to be no spring moult, summer and winter plumage being therefore alike.

The male and female in their first year are alike and closely resemble the second phase of adult female colouration. They can, however, be usually distinguished from the latter by the presence of the wing-feathers retained from the juvenile plumage and by the fact that the accidental moult of odd feathers tends to make the dark sooty-grey of the upper parts blotched with black in some specimens.

The juvenile plumage follows the same colour pattern as the first-year birds; the black or dark sooty-grey of the body and coverts is, however, replaced by ashy grey-brown, and the white parts of the plumage are washed with creamy fulvous. The quills of the wing and tail are a much browner black than in the adult.

The post-juvenal moult does not appear to be ever quite complete, but the extent to which it embraces the wings and tail appears to be variable.—H. W.]

The Large Pied Wagtail is a fairly common resident species in both Travancore and Cochin. Ferguson says (*J.B.N.H.S.*, xv, 471) that it does not ascend the Travancore hills, but the Surveys found it from the neighbourhood of the backwaters and coast up to 5,000 ft. elevation. I suggest that it usually prefers the low country to the hills on account of its predilection for more or less smooth-running streams in open country rather than hill torrents, and that it occurs wherever such are to be found irrespective of the elevation. The birds are usually seen in pairs, never very widely separated, tripping lightly over stones in the stream bed or on its banks and calling in sweet, clear whistling notes. It was also observed by irrigation tanks and pools, and frequently on stakes, moorings and jetties in the backwaters. Large numbers roosted in company with other wagtails and swallows on the reedy islets in the backwaters. At Mūnnār a favourite roost was the tangled growth overhanging the banks of the Mūnnār stream near the Club.

In the Palni Hills, Terry (*S.F.*, x, 477) noted this wagtail at the end of May by the side of a stream at Pumbarrah [elevation?]. It is said to be an extremely rare straggler to Ceylon.

Breeding: On 29 November a bird was observed carrying nesting material to the top of a masonry pile of the old railway bridge across the Shoranūr River (Cochin). Another pair were trying to build on a rafter under the eaves of the Travellers' Bungalow at Mūnnār on 16 January. On the Periyār River at Thattākād (11 February) two juveniles with ashy grey-brown backs were observed being fed by adult birds. Courtship was in progress generally at this time and males were singing from rooftops, rocks in river beds, etc. On 16 February a pair were observed in copula on the ground in the compound of the Travellers' Bungalow at Kottāyam. The preliminaries consisted of the male puffing out his plumage and with outstretched wings raised vertically back to back, approaching the female, singing excitedly the while. The female ducked somewhat, at the same time elbowing out her wings laterally, and shivered as when asking to be fed. The male hopped lightly but rigidly on to her back from behind, she dipping her posterior somewhat to accommodate him and thus coitus was effected. These proceedings took place in the morning at about 8 o'clock.

Ferguson states that in Travancore this wagtail breeds at the end of the year. The skull of a specimen—No. 701—was reported by Mr. Pillai to be imperfectly ossified as late as 21 July.

Motacilla cinerea caspica S. G. Gmelin. The Eastern Grey Wagtail.

Specimens collected:—61 ♂ 11-1-33 Marāiyūr 3,000 ft.; 137 ♀ 23-1-33, 198 ♀ 31-1-33 Sānthanpāra 3,500 ft.; 335 ♂ 22-2-33 Peermade 3,200 ft.; 866 ♂ 14-11-33 Kūriārkūtti 1,600 ft.

Elsewhere noted at: Mūnnār (5,000 ft.—High Range); Thattākād (200 ft.) Kūmili and Periyār Lake (3,000 ft.); Camp Derāmalāi (3,000 ft.); Tenmalāi (500 ft.); Nemmāra (300 ft.—only a single !); Pādagiri (3,000 ft.—Nelliampathy Hills).

Colours of bare parts: Iris brown; bill horny-brown, paler at chin and on commissure; mouth pale yellowish-pink; legs and feet brownish-flesh colour; claws dusky.

[Other specimens seen:
Brit. Mus. Coll.: ♀ 13-4-75, ♂ 5-11-78, ♂ 8-11-78, ♂ 4-12-78 Mynall, Travancore (Bourdillon).

Measurements:

	Bill.	Wing.	Tail.
3 ♂♂	16-17	83.5-87	91-95 mm.
2 ♀♀	16-17	79-82	88-88.5 mm.

In this form the male and female in winter plumage are alike, the adults and first winter birds being separable only with difficulty by the fact that the latter retain the worn primaries and primary coverts, secondaries, sometimes the tertiaries, and the greater and median coverts of the juvenile plumage. The adult males average a deeper brighter yellow and the first winter males average a paler and less generally distributed yellow on the lower parts, but there is a good deal of variation and individual birds could hardly be picked out. In fresh plumage there is a variable amount of green wash on the upper parts, but this gradually wears off. There is apparently a pre-nuptial moult usually confined to the body plumage but sometimes extending to the tertiaries and central tail feathers. In breeding plumage first summer females do not appear to differ from the above general winter plumage, but adult females have the white of the chin and throat more or less variegated with black. The males on the other hand become a rather purer slate-grey on the upper parts and ear-coverts, the supercilium becomes purer white, the chin and throat become black leaving a white malar streak on each side, and the lower parts become a deeper more uniform yellow. The feathers of the black throat-patch may be fringed with white which gradually wears off. First-year males may then only be distinguished with difficulty by the worn appearance of the juvenile feathers of the wings and tail. The post-nuptial moult is complete.

The juvenile retains the general colour pattern of the adult winter plumage, but the greater and median wing coverts are edged with buff, the yellow of the lower plumage is very pale and the breast is washed with buff. The post-juvenal moult does not include the primaries and primary coverts, the secondaries and greater and median coverts, nor usually, I think, the tertiaries and tail.—H. W.]

The Grey Wagtail according to Ferguson (*J.B.N.H.S.*, xv, 471) is one of the earliest winter visitors to arrive in Travancore where it stays well on into May. The latest date on which I have a sight record is 25 March, and it was noted that by 27 April when the next suitable locality in the hills (Balamore Estate) was visited, it had completely disappeared. Kinloch (*J.B.N.H.S.*, xxvii, 941) writes that in the Nelliampathy Hills it arrives early in October and leaves in early March. Although exceptionally met with at lower elevations, Ferguson is correct in saying that it is found only in the hills from about 1,000 ft. upwards. Coming down the Mūnnār Ghat, single Grey Wagtails, which were being constantly put up from the road by our motor bus, disappeared conspicuously below this elevation. Similarly on the road from Kottāyam (ca. S.L.) to Peermade (3,200 ft.) our bus encountered the first of numerous subsequent Grey Wagtails only at Mundakāyam ca. 1,200 ft. In the hills of both Travancore and Cochin the birds were common. They were invariably met with singly, running about and feeding on roads and paths through secondary evergreen as well as bamboo forest, and especially through tea, coffee and cardamom plantations. Often also by forest streams and trickles. On one occasion several Grey Wagtails were observed hawking insects over a steep fall in the Parambikolam River. They launched aerial sallies after them from the adjacent rocks and turned and twisted in the pursuit with great agility.

In specimen No. 61 the left wing was a mere stump with the carpal region and primaries missing. In spite of this deformity—evidently congenital—the bird flew with little apparent difficulty, though when taking off the movement was somewhat lop-sided or rotatory as in a dove suddenly frightened off the ground. It is remarkable that even with this obvious handicap the bird should have successfully accomplished its long migratory journey and reached almost the southernmost extremity of its Indian range.

This was the only species of migratory wagtail observed in the hills of Travancore and Cochin.

Terry (*S.F.*, x, 477) records it from the Palni Hills where its status is presumably the same as in our area. It is a winter visitor to Ceylon from the middle of September to the end of March.

Motacilla flava thunbergi Billberg. The Grey-headed Wagtail.

Specimens collected: 282 o? 15-2-33 Vembanād Lake, Kottāyam Backwaters; 521 o? 7-4-33, 558 ♀ 10-4-33, 584 ♂, 585 ♂ Cape Comorin (ca. S.L.); 608 ♂ 17-4-33 Arāmboli 250 ft.

[Measurements:

	Bill.	Wing.	Tail.	Tarsus.
3 ♂♂	16	82-85.5	75-77	23-24.5 mm.
1 ♀	16.5	80	—	22 mm.

Not previously recorded from Travancore though a common winter visitor to Ceylon.—H. W.]

Motacilla flava simillima Hartert. The Short-tailed Grey-headed Wagtail.

Specimens collected: 609 ♀ 17-4-33 Arāmboli 250 ft.; 1039 ♂ 29-12-33 Karūpadanna ca. S.L.

[This race—the *Motacilla flava* of the *Old Fauna*—was omitted entirely in the *New Fauna* but restored with a brief notice in vol. viii, 660. It is the breeding form of Kamschatka and is well known to winter in Burma (cf. *J.B.N.H.S.*, xxxvi, 931) but this appears to be the first record of the race in South India, providing another interesting illustration of the fact that Travancore winter visitors are apt to arrive from the eastern side of Asia. The very dark ear-coverts and the pale superciliary stripe are diagnostic, and my identification has been confirmed by Dr. C. B. Ticehurst.

Measurements:

	Bill.	Wing.	Tail.	Tarsus.
♂	16	83	69	24 mm.
♀	15.5	78	65.5	22.5 mm.—H. W.]

Elsewhere not noted.

Colours of bare parts (both races): Iris brown; bill horny-brown, paler (yellowish) on commissure and at base of lower mandible; mouth pale yellowish-pink; legs, feet and claws blackish-brown; soles yellow.

The Surveys found these two races of the Grey-headed Wagtail—not previously recorded from Travancore or Cochin—common and abundant in the low country, especially on the grassy banks and bunds and water-logged ploughed or fallow fields along the backwaters and by irrigation tanks. Both races occurred together gregariously, and no other migratory wagtails were noted with them. They were not met with in the hills at all. A specimen on 10 April and the two procured on the 17th of that month were very fat. They were undergoing pre-nuptial body moult, the rectrices and remiges being fresh. Flocks of 30 to 50 birds were common at this time, and it was evident that they were massing for the northward migration.

Dendronanthus indicus (Gmelin). The Forest Wagtail.

Specimens collected: 222 ♀ 4-2-33 Thattākād 200 ft.; 374 ♀?, 375 ♂ 28-2-33 Kūmili 3,000 ft.; 879 ♂ 17-11-33 Kūriārkūtti 1,600 ft.; 973 ♂ 13-12-33 Pādagiri 3,000 ft.

Elsewhere noted at: Camp Derāmalāi (3,000 ft.); Rājampāra (1,350 ft.); Tenmalāi (500 ft.); Arāmboli (250 ft.).

Colours of bare parts: Iris hazel-brown to dark brown; bill upper mandible horny-brown, lower mandible pale flesh colour; mouth pale yellowish flesh colour; legs and feet brownish-flesh colour; claws duskier.

[Other specimens seen:

Brit. Mus. Coll.: ♀ 23-11-74, ♂ 12-11-78 Mynall (Bourdillon).

Measurements:

	Bill.	Wing.	Tail.	Tarsus.
3 ♂♂	17-18.5	81-82.5	66.5-68	21-21.5 mm.
2 ♀♀	17	75-80	68	21 mm.—H. W.]

The Forest Wagtail is a well distributed but not abundant winter visitor to the States. Bourdillon says that it arrives in Travancore soon after the Grey Wagtail and stays nearly as long as that species. The last date of which I have a record is 21 April. It affects well-wooded country and in both Travancore and Cochin the Surveys came across it from about 200 ft. up to an elevation of at least 3,500 ft. A few birds were also observed at Arāmboli where they kept under a dense grove of *Acacia planifrons* surrounded by open cultivated country in the 'Gap' or pass through the southern extremity of the Ashāmbu Hills. These wagtails were usually met with singly or in widely separated pairs on footpaths and small clearings in forest, both evergreen and deciduous. Well-shaded plantations of coffee and cardamoms are favourite haunts where, as Kinloch remarks, they feed on the insects which infest the thick mulch of dead and decaying leaves. The notes commonly uttered are a *pink*, *pink*, very reminiscent of the Chaffinch as is also their flight. When alarmed, the birds usually fly up into the overhanging branches of trees where they pivot about silently, turning one way then another, and descend again to feed as soon as their suspicion is allayed.

This species has not been recorded from the Palni Hills. In Ceylon it is a common winter visitor from October to March.

[**Anthus trivialis trivialis** Linnaeus. The Tree Pipit.

Not met with by the Surveys nor apparently by any previous collectors in this area. The statement in the *Fauna* (iii, 279) that it extends south to Travancore in winter needs confirmation. The southernmost authentic record so far is from the Nilgiri Hills (*J.B.N.H.S.*, xxxvii, 96).]

Anthus hodgsoni hodgsoni Richmond. The Indian Tree Pipit.

Specimen collected: 991 ♂ 18-12-33 Pādagiri (3,000 ft.—Nelliampathy Hills).

Elsewhere not noted.

Colours of bare parts: Iris hazel brown; bill upper mandible dark horny-brown, lower pale flesh colour; gape yellow; mouth yellow and pink; legs and feet yellowish-brown; claws horny-brown.

[Additional specimens seen:

Brit. Mus. Coll.: o? -3-83 Kodāikānal (Hume Coll.); o? no date Peermade (Fry).

Measurements:

	Bill.	Wing.	Tail.
1 ♂	16	89	62.5 mm.—H. W.]

The Survey does not appear to have come across the Indian Tree Pipit in Travancore. Ferguson (*J.B.N.H.S.*, xv, 471) however, collected specimens on the High Range (in April) and at Chimunji in South Travancore in open grassland surrounded by forest at an elevation of about 4,000 ft. He only saw the bird at high elevations on the hills and never in the low country. My experience in Cochin agrees with this. The species was fairly common about Pādagiri in the Nelliampathy Hills (3,000 ft.). Single birds, small parties of 4 or 5, or flocks of up to 15 individuals were usually observed feeding among the fallen leaves in the tea, coffee and cardamom plantations. When disturbed they flew up into the tall *Grevillea* and other shade-trees uttering a single sharp *tseep* from time to time.

Terry (*S.F.*, x, 477) saw it frequently in March at Kodaikanal and it presumbaly has the same status in the Palni Hills as in Travancore and Cochin. It has not occurred in Ceylon.

Anthus nilghiriensis Sharpe. The Nilgiri Pipit.

Not procured by the Surveys. There are 3 specimens dated 25-29 January 1901 from Devicolum (High Range) in the Trivandrum Museum. Mr. Whistler measures these as follows:

	Bill.	Wing.	Tail.	Tarsus.
2 ♂♂	16.5-17	77.5-78.5	60-66.5	24-25 mm.
1 ♀	16	82	67.5	25 mm.

Mr. Whistler has also examined the following series from the Palni Hills in the British Museum Collection: ♀ 9-6-77 Kodaikanal 7,000 ft.; ♂ ♀ 30-5-77 Top of Palnis; ♂ 30-3-77 Top of Palnis; Mt. Nabu 7,000 ft.; ♂ 9-6-77 Top of Palnis, 7,000 ft. All these specimens were collected by Fairbank.

Ferguson (*J.B.N.H.S.*, xii, 203) had a specimen from Ponmudi in South Travancore. He describes this pipit as a fairly common resident on the open grass lands on the High Range (*Ibid.*, xv, 471). There is nothing recorded about it from Cochin, but its status in the hills there is doubtless the same as in the Travancore ranges and the Palnis. Terry (*S.F.*, x, 477) found it very common on the tops of all the latter and breeding everywhere. He obtained a nest with c/3 at Pittur on 5 May. The breeding season according to this observer, Davison and Betham is April and May (*J.B.N.H.S.*, xxxvii, 97).

It is not found in Ceylon.

Anthus similis similis Jerdon. The Rufous Rock Pipit.

Specimens collected: 648 ♂ 23-4-33 Balamore Estate at 3,500 ft. (Ashāmbu Hills).

Elsewhere not noted.

Colours of bare parts: Iris hazel brown; bill upper mandible dark horny brown, lower pale flesh; gape yellow; mouth pinkish yellow; legs and feet yellowish-brown; claws horny-brown.

[Measurements:

	Bill.	Wing.	Tail.	Tarsus.
1 ♂	20.5	93.5	78	26.5 mm.

No other Travancore specimens seen.—H. W.]

As Ferguson remarks (*J.B.N.H.S.*, xv, 472) the Rufous Rock Pipit is a resident but rare bird in Travancore. He had a single specimen shot at Ponmudi (3,500 ft.) in August 1900. The Survey also came across a single pair on a grassy hilltop with outcrops of rock.

According to Hume (*S.F.*, i, 203) it occurs in the Palni and Annemalai Hills. It is not found in Ceylon.

Breeding: The testes of the specimen (23 April) measured 7×5 mm. and the birds were evidently breeding. The doubt cast in the *Fauna* (iii, 285) on Bourdillon's record of its breeding in the higher hills of Travancore therefore is scarcely justified. This doubt, however, seems only in respect of the eggs sent by Bourdillon to Stuart Baker thence, and not to the fact of breeding (*Nidification*, iii, 142).

Anthus richardi Vieillot. Richard's Pipit.

Specimens collected: 513 ♀, 514 ♂, 515 ♂ 5-4-33 Velayāni Lake, Trivandrum Environs; 576 o? 12-4-33 Cape Comorin ca. S.L., 917 ♀ 28-11-33 Wadakkāncheri 400 ft.; 1040 ♂ 30-12-33 Karūpadanna ca. S.L.

Elsewhere not noted.

Colours of bare parts: Iris brown; bill horny-brown, paler on lower mandible except tip; mouth pink; legs, feet and claws brownish flesh colour; soles bright chrome yellow.

[Measurements:

	Bill.	Wing.	Tail.	Tarsus.
4 ♂♂	17-19	99-100	75-78	29.5-31 mm.
2 ♀♀	17-18.5	93	72	31 mm.

The only other Travancore specimens seen are two in the Trivandrum Museum. These two specimens marked *striolatus* (♂ 4-3-02 and ♂ 2-3-02 Trivandrum) and of Ferguson's collecting, prove to be really specimens of *A. richardi* which is not included in Ferguson's list and which the Survey has proved to be a common winter visitor to Travancore. It appears therefore that Ferguson's note on *A. striolatus* should really refer to *A. richardi.*

The late departure of this species from Ceylon and Travancore is no doubt correlated with the heavy moult in April.—H. W.]

Richard's Pipit is a winter visitor to the low country of Travancore and Cochin. It frequents swampy terrain with rank grass—typical snipe marshes—by the backwaters and irrigation tanks. Also dry, cut paddy fields in the neighbourhood of water, frequently in association with other pipits, Black-bellied Finch Larks and Skylarks. It was usually met with singly or in pairs. By the middle of April the majority of birds appeared to have left.

It has not been recorded in the Palni Hills. In Ceylon it is a winter visitor from October to May.

Anthus rufulus malayensis Eyton. The Malay Pipit.

Specimens collected: 11 ♂ 5-1-33, 43 ♂ 9-1-33, 56 ♀ 10-1-33 (at 6,000 ft.), 62 ♂ 11-1-33 Marāiyūr 3,500 ft.; 157 ♀ 25-1-33, 193 ♂ 30-1-33 Sānthanpāra (4,000-4,500 ft.); 218 ♂ 4-2-33 Thattākād 200 ft.; 326 ♂ 21-2-33 (4,000 ft.), 339 ♀ 23-2-33 (4,000 ft.), 352 ♀ 24-2-33 Peermade 3,200 ft.; 369 ♂ 27-2-33, 398 ♂ 3-3-33 Kūmili 3,000 ft.; 437 ♂ 11-3-33 Camp Derāmalāi 4,000 ft.; 516 ♂ juv. 5-4-33 Trivandrum (Velayāni Lake); 548 ♂ 9-4-33, 577 ♀ 12-4-33 Cape Comorin ca. S.L.; 656 ♂, 657 ♀ 25-4-33 Mūthūkūzhi 3,500 ft.; 770 ♀, 773 ♂ 2-8-33, 800 ♀, 802 o? 7-8-33, 851 ♂, 852 ♀, 853 ♂, 854 ♂ 14-8-33 (Golf Links) Trivandrum; 893 ♂ 24-11-33 Wadakkāncheri 400 ft.; 985 ♂, 986 o? 16-12-33 Pādagiri 4,000 ft.; 1004 ♂ 25-12-33 Karūpadanna ca. S.L.

Elsewhere noted at: Trichūr.

Colours of bare parts: Iris brown; bill upper mandible and tip of lower horny brown, rest of lower mandible pale flesh colour; gape yellow; mouth orange yellow, bright yellow or yellow and pink varying with age; legs and feet brownish-yellow; claws dusky.

[This fine Travancore-Cochin series yields the following measurements:

	Bill.	Wing.	Tail.	Tarsus.
18 ♂♂	15.5-17.5	(75.5) 79-87.5	55-62	24-26.5 mm.
9 ♀♀	15-17	75-84	54-60.5	23.5-26.5 mm.

In the Hyderabad Survey (*J.B.N.H.S.,* xxxvi, 911) and the Eastern Ghats Survey (*J.B.N.H.S.,* xxxvii, 101) I suggested both that a new race of this pipit required naming and that it was difficult to decide the identity of birds from South-West India. I have now been able to assemble about 140 specimens of this pipit from different parts of India supplementary to the good series in the British Museum, and there is now no great difficulty in understanding the position. In North-West India this pipit has the upper parts a pale rather sandy coloured brown, very similar to that of the Tawny Pipit; the lower parts are also pale being generally speaking whitish with a faint buff wash over the breast and flanks. In Ceylon it is a much more richly coloured bird. The upper parts are a rich fulvous brown, very similar to that of Richard's Pipit; the lower parts are also richly coloured being generally speaking warm buff, with the throat and centre of the abdomen whitish. There is complete intergrading between these two extremes and it is virtually impossible to draw any exact dividing line between stages in the intergrading as the effect of wear and individual variation are apt to obscure the differences. The type-locality is unfortunately Bengal, an intermediate locality from which few specimens are available.

Ticehurst considers (*J.B.N.H.S.*, xxxii, 352) that birds from Ceylon should be separated as *malayensis* and I quite agree that birds from Ceylon and the Malay Peninsula are exactly alike. With them I am inclined to include our Travancore series. The majority of these, which are in more or less worn plumage, cannot be separated from similar worn birds in the Peninsula generally. The three freshly moulted specimens, however, agree with Ceylon birds in the greater amount and depth of buff on the lower plumage and this I cannot match with other Peninsula birds.

With common, widely distributed forms whose races intergrade, the definition of the distribution of the recognisable races has at times to be somewhat arbitrary. The very pale north-western race as described above I would recognise from the North-West Frontier Province, the Punjab and United Provinces, extending southwards over Sind and Rajputana to the Nerbudda River. For this I propose the name (in grateful acknowledgment of all the assistance I have had from a fellow ornithologist in the Punjab)

ANTHUS RUFULUS WAITEI subspecies nov.

Type: ♂ 16 February 1926, Jhelum, Punjab, H. W. Waite Collection, No. 2.

The typical race is taken as distributed over the remainder of India except for Cochin and Travancore States.

In Travancore the complete post-nuptial moult takes place mostly in August. There appears to be no spring moult, and as far as I can make out the post-juvenal moult appears to be complete.

It is interesting to note that the two birds from Cape Comorin are much paler than the others and may well belong to the typical race. The possibility that both *rufulus* and *malayensis* occur in Ceylon in different climatic zones should be borne in mind in view of Legge's remarks.—H. W.]

The Malay Pipit is an abundant resident species in both Travancore and Cochin. The Surveys found it common in the low country as well as in the hills up to at least 6,000 ft. elevation. In the former it affects ploughed and stubble fields, sparse grass-covered and stony fallow land and also the neighbourhood of the backwaters and irrigation tanks. In the hills it is found freely on the grassy slopes and summits particularly where stony, and where outcrops of sheet rock occur. Single birds, pairs or widely scattered parties of 4 or 5 were met with. Males were constantly rocketing up and soaring with a feeble 'cheeping' song, and shooting back to earth.

Specimen No. 437 was club-footed, a deformity which appeared to be either congenital or to have been contracted early in life as it in no way interfered with the normal functions of the bird. The enlarged gonads showed that it was even ready to breed.

Terry (*S.F.*, x, 478) found this Pipit common in the Palni Hills, and Fairbank (*S.F.*, v, 407) obtained specimens both at the base of the hills and 4,000 ft. up. The race *malayensis* is common in Ceylon.

Breeding: The majority of the specimens collected between November and April had enlarged gonads, and from various other signs such as birds carrying building material or food for young, it was evident that they were breeding generally throughout this protracted period. Our earliest specimen with organs in breeding condition was on 24 November; latest 25 April. The gonads of all the adult August specimens had reverted to normal non-breeding condition and the birds were in heavy post-nuptial moult.

Terry took a nest with c/3 at Pittur in the Palnis at the beginning of May.

Anthus campestris thermophilus Jerdon. Blyth's Pipit.

Specimen collected: 642 ♀ 21-4-33 Arāmboli 250 ft.

Elsewhere not discriminated?

Colours of bare parts: Mouth pinkish flesh colour, otherwise as in *A. r. malayensis*.

[The specimen measures:

Bill.	Wing.	Tail.	Tarsus.
16	90.5	damaged	26.5 mm.

For a note on this form, see *J.B.N.H.S.*, xxxvii, p. 100.—H. W.]

This Pipit was observed in small numbers, usually singly or in widely separated pairs, in fallow fields etc. in the Arāmboli 'Gap'.

Ferguson (*J.B.N.H.S.*, xv, 472) writes under '*Anthus striolatus*' (a synonym of this bird) as follows: 'Blyth's Pipit is a winter visitor (to Travancore) and may be found in fairly large numbers in the dry paddy fields in February and March after the crops have been cut.' Mr. Whistler's remarks under *Anthus richardi* have shown that the above note refers in reality to that species.

Blyth's Pipit is a straggler to Ceylon.

FAMILY: ALAUDIDÆ.

Alauda gulgula australis Brooks. The Small Nilgiri Skylark.

Specimens collected: 158 ♂ 25-1-33 Sānthanpāra 4,000 ft.; 295 ♀, 296 ♂, 297 ♀ 17-2-33 Kottāyam ca. S.L.; 325 ♂ 21-2-33, 340 ♂ 23-2-33 Peermade 4,000 ft.; 440 ♀, 441 ♂ Camp Derāmalāi 4,000 ft.; 914 ♂ 27-11-33; 915 ♂, 916 ♀ 28-11-33 Wadakkāncheri 400 ft.

Elsewhere noted at: Velayāni Lake, Trivandrum Environs.

Colours of bare parts: Iris hazel brown; bill upper mandible horny brown, lower pinkish flesh-colour; mouth pink or yellowish-pink; legs, feet and claws brownish flesh-colour.

[In the Eastern Ghats Survey (*J.B.N.H.S.*, xxxvii, 102) I referred the fine series of skylarks from the Godavery Delta to *Alauda gulgula australis* with considerable hesitation, and hoped to return to the question in the Travancore Survey. My reason for this hesitation was the smaller size of the Godavery birds compared with those from the Nilgiris and a feeling that this group required further study. I have now been into this group again—aided by this fresh series—and consider that three races are required in place of the two already recognised in continental India.

These two races are attributed in the *New Fauna* (iii, 319) to North and South India respectively. The typical race is said to occur in 'Tropical North India [whatever that means], Assam and Burma. In India south to Khandesh and roughly to a line from Hyderabad to Masulipatam.' *A. g. australis* is said to occur in India south of the typical race and in Ceylon.

The main objections to this grouping are two. Under the typical race are included the very pale birds of North-Western India and the darker birds of Bengal and other areas, while under *A. g. australis* are included the large birds of the south-western hill ranges and the smaller birds of the central and eastern plains. These anomalies are avoided by the recognition of three races.

The pale north-western race extends throughout the Punjab and the United Provinces as far east as Mogulserai and Dinapore. It is therefore necessary to restrict Franklin's rather composite type-locality in which, during the course of his journey, he might have met with both the pale and dark forms. I therefore now restrict the type-locality of *Alauda gulgula gulgula* to the Ganges between Calcutta and Benares, so that that name may continue to be used for the darker of the two birds, with which it is commonly associated.

This leaves the North-Western birds without a name and for them I propose

ALAUDA GULGULA PUNJAUBI subsp. nov.

This race differs from *A. g. gulgula* in its markedly paler colouration both on the upper parts and the lower parts, in fresh plumage and in worn. The pale fringes are colder in tint and the dark streaking is narrower and less intense. The buff of the lower parts does not extend from the breast to the vent but largely disappears on the abdomen. It is a slightly larger bird: Wing: 10 ♂♂ 92.5-97 mm.; 5 ♀♀ 86.5-94 mm.

Type: H. Whistler Collection, No. 598, ♂ 28 April 1912, River Sutlej, Ferozepore. Deposited in the British Museum.

A. g. gulgula extends in my opinion all down Eastern, Central and Southern India—wherever this lark occurs for it is somewhat local—to and including Ceylon where it breeds in the drier areas. To this belongs the Godavery Delta series tentatively attributed to *A. g. australis* in the Eastern Ghats Survey.

Alauda gulgula australis differs from the typical race in its larger size, and from *A. g. punjaubi* in its darker colouration. It measures:

	Bill.	Wing.
11 ♂♂ Nilgiris	16.5-17	93.5-102 mm.
10 ♀♀ „	16-17	89.5-93 mm.

as compared with *A. g. gulgula* which measures:

	Bill.	Wing.
3 ♂♂ Bengal	16-16.5	89.5-90.5 mm.
2 ♀♀ „	14-15.5	85.5-88 mm.
24 ♂♂ Godavery Delta	14-16 (once 13)	87-93 mm.
3 ♀♀ „	13-14.5	84.5-85.5 mm.

The Survey series from the Travancore hill ranges agrees with Nilgiri birds both in colour and in measurements, though odd birds are a little darker than Nilgiri specimens. They measure:

	Bill.	Wing.	Tail.	Tarsus.
6 ♂♂	15-16	90-96	51.5-55	23.5-25 mm.
4 ♀♀	15-16.5	83.5-88	49-54	22-24 mm.—H. W.]

The Nilgiri Skylark is a common resident species in Travancore and Cochin. The Surveys found it in the low country by the backwaters, as well as up to 4,000 ft. in the hills, and it probably occurs higher. In the low country it affects cut paddy fields and was also noted in numbers on bunds and footpaths through the standing crops ready to be harvested in a fortnight or so. In the hills, the open rounded grassy summits and upper slopes as at Peermade constituted favourite haunts. As courtship was in progress everywhere, males were conspicuous soaring, fluttering in the air with legs dangling, and singing for well over 5 minutes at a stretch.

In the Palni Hills, Terry (*S.F.*, x, 478) found this Skylark common on the top of bare rocky hills. The same race *australis* occurs in Ceylon.

Breeding: All the specimens collected between 27 November and 5 April had their gonads in breeding condition. In 5 of the males the testes measured 7×5 mm. and in the sixth 6×4 mm. The ovarian follicles of all the females except one were enlarged from 1 to 3 mm. in diameter. Bourdillon in a note to Stuart Baker (*Nidification,* iii, 163) mentioned that they lay 4 to 5 eggs and later altered it to 3 to 4. According to the *Fauna* (iii, 321) the principal breeding season in South India is March to May, but many birds are said to breed again from August to November. I am unable to say anything about the second breeding period, but the birds in Travancore and Cochin certainly seem to breed uninterruptedly from November to May, and they may well be found to continue throughout the year without the break.

In the Palni Hills Terry got a nest at Pulungi and another at Pittur in April.

Calandrella brachydactyla dukhunensis (Sykes). The Rufous Short-toed Lark.

Speicmen collected: 1003 ♂ 25-12-33 Karūpadanna ca. 50 ft.

Elsewhere not noted.

Colours of bare parts: Iris hazel brown; bill pale horny-brown, darker on culmen and tips; legs and feet brownish flesh colour; claws darker brown.

[Measurements:

Bill.	Wing.	Tail.	Tarsus.
13	103.5	58.5	21 mm.

This is a considerable extension of the known range as this Lark has not hitherto been recorded south of North Kanara (*J.B.N.H.S.*, xi, 674).

This race appears to undergo a complete post-nuptial moult in its breeding quarters before coming down to winter in India, and then about January to March there is, in the winter quarters, a pre-nuptial moult confined to the body plumage.—H. W.]

The only locality in which the Short-toed Lark was met with by the Travancore or Cochin Surveys was Karūpadanna near the backwaters in the latter State. Here a flock of about fifty birds was observed on three consecutive evenings coming to roost at dusk among the scraggy grass on the open laterite plateau adjacent to the Travellers' Bungalow. The stomach and crop of the specimen were full of paddy grains gleaned from the neighbouring fields.

It has not been recorded from Ceylon.

Mirafra affinis ceylonensis subsp. nov. The Ceylon Bush Lark.

Specimens collected: 239 ♂, 240 ♂ 8-2-33 Thattākād 200 ft.; 606 ♀ 17-4-33, 641 ♂ 21-4-33 Arāmboli 250 ft.; 535 ♂, 536 ♂ 8-4-33, 553 ♂ 10-4-33 Cape Comorin ca. S.L.; 735 ♂ 26-7-33 (Kūttāni 300 ft.); 756 ♂ 31-7-33 (Akkūlam 150 ft.); 771 ♂, 772 ♂ 2-8-33, 801 ♀ 7-8-33 (Golf Links); 823 ♂ 10-8-33 (Kūttani 300 ft.); 855 ♂ 14-8-33 (Golf Links) Trivandrum Environs; 911 ♂ 27-11-33; 942 o? 5-12-33 Nemmāra 300 ft.; 1014 ♂ 26-12-33 Karūpadanna ca. S.L.

Elsewhere not noted.

Colours of bare parts: Iris hazel brown or brownish-straw; bill horny-brown, paler (flesh-coloured) at gape and base of lower mandible; mouth pink; legs, feet and claws brownish flesh-colour.

[Additional specimen seen:

Brit. Mus. Coll.: ♂ 7-6-97 Periakulam, eastern base of Palnis (Fairbank).

When writing the Eastern Ghats Survey Report I was not able to see a satisfactory series of these larks from Travancore and Ceylon, but that deficiency has now been remedied by the admirable series collected in Travancore by Mr. Sálim Ali and by the loan of a series from the Colombo Museum. These confirm my original opinion that Travancore and Ceylon birds are slightly darker and have larger bills than birds from the eastern side of India. Colour is not a very good character as this species bleaches so markedly and apparently so quickly that there is much variation in any series, but the difference in size in the beak cannot be overlooked, especially as a large beak is the racial characteristic of several Cinghalese forms.

This character is shown by the following measurements:

	Bill.	Wing.	Tail.
11 ♂♂ Ceylon	16-18.5	79.5-90	43-50.5 mm.
3 ♀♀ Ceylon	16.5-17.5	81-82.5	— mm.
15 ♂♂ Travancore	16-18	79.5-89	42-52.5 mm.
2 ♀♀ Travancore	15-16.5	78	39-41 mm.
26 ♂♂ E. Ghat Survey	14.5-17.5	77-88	43-50 mm.
13 ♀♀ E. Ghat Survey	13-17	75-82	38.5-45 mm.

The significance of these figures—and the comparative size of beaks is admittedly difficult to appreciate from measurements—is more evident when I state that out of the 31 Ceylon and Travancore specimens all but 8 measure 17 mm. and upwards, whereas in the 39 Eastern Ghat specimens all but 2 measure under 17 mm. I am of opinion that this difference must be recognised and accordingly propose for Ceylon and Travancore birds the name

MIRAFRA AFFINIS CEYLONENSIS subsp. nov.

Type: ♂ dated 7-11-1877, Colombo, Ceylon. Collected by Messrs. Hart Bros. (British Museum Collection).

It seems probable that this form will be found to occur as far north as North Kanara. I have seen no further evidence as yet to settle the question of the specific identity or otherwise of *Mirafra affinis* and *M. erythroptera*.

The post-juvenal moult is complete. There is no pre-nuptial moult. The post-nuptial moult begins with the body plumage and tertiaries, then spreads to the wing quills and finally to the tail, the tail beginning sometimes after the body and wing moult is nearly finished. This order is also, apparently, observed in the post-juvenal moult.—H. W.]

The Ceylon Bush-Lark is a common and resident species in the low country of both Travancore and Cochin. The Surveys never met with it above 500 ft. elevation. It inhabits open cultivation, sparse scrub-and-bush country, fallow land and grassy hummocks with outcrops of sheet rock. The males have a habit of springing up into the air every now and then for about 20 ft. or so, uttering a feeble, mousy song *swīr, swīr swīr,* etc., of the volume and quality of a Purple Sunbird's notes, and parachuting down in spirals—wings outstretched and motionless, legs dangling—to perch on a bush-top or clod.

In the hand the bills of the specimens at once struck me as enormous as compared with those obtained in the Hyderābād State.

It has been obtained on the eastern (dry) base of the Palni Hills in June (*S.F.*, v, 408—specimen in British Museum) and is found in Ceylon, presumably in similar facies.

Breeding: No satisfactory data as regards breeding was obtained by the Surveys though several of the specimens collected between 27 November and 10 April as well as in the first half of August showed a slight departure in their gonads (3×2 to 5×2 mm. in males) from the normal non-breeding condition. The earlier specimens, however, from their comparatively fresh plumage suggested that their gonads were developing, while all the August specimens were undergoing more or less heavy post-nuptial moult indicative of having finished breeding. This would point to the breeding season being April, May, June and possibly July, but it is not inconceivable that, as is said to be the case in Ceylon, this Bush-Lark may breed throughout the year, relays of birds presumably becoming sexually mature at different times.

Ferguson (*J.B.N.H.S.,* xv, 472) found a nest containing a single egg in the Public Gardens, Trivandrum, on 26 April 1902. According to *Nidification* (iii, 174) Bourdillon and Stewart took eggs in Travancore in March, April and May.

Galerida malabarica Scopoli. The Malabar Crested Lark.

Not procured by the Surveys. Possibly confused with *Alauda*? Mr. Whistler has examined four specimens in the Trivandrum Museum labelled as follows: ♂♂ 19-6-02, ♂ 20-6-02 Quilon; ♂ 7 June (?) Muttam (?). He does not record measurements from doubt of the sexing. There are also three Anjango specimens in the British Museum Collection.

Ferguson (*J.B.N.H.S.,* xv, 472) only observed and collected this Lark on the High Range at 6,000 ft. elevation, where according to him it was fairly abundant and going about usually in small flocks.

It has not been recorded in the Palni Hills and it does not occur in Ceylon.

Eremopterix grisea grisea (Scopoli). The Ashy-crowned or Black-bellied Finch-Lark.

Specimens collected: 522 ♂ 7-4-33; 552 nestling (in alcohol) 9-4-33 Cape Comorin ca. S.L.; 679 ♂ 16-7-33, 733 ♀ 27-7-33 Beach, Trivandrum; 912 ♂ 27-11-33 Wadakkāncheri 400 ft.

Elsewhere noted at: Marāiyūr (3,000 ft.); Arāmboli (250 ft.); Nemmāra (300 ft.); Karūpadanna (ca. S.L.).

Colours of bare parts: *Adult:* Iris brown; bill greyish-white, dusky on culmen; mouth pink; legs, feet and claws brownish flesh-colour. *Nestling* (No. 552): Gape and mouth bright orange; a black point each at tip of upper and lower mandible; a black point at tip of tongue and one each on either side of base of tongue.

[No. 679 has the bill 14 mm. which is without parallel in the very large number of Indian and Cinghalese birds which I have measured. It must be abnormal. Excluding this, the series measures:

	Bill.	Wing.	Tail.
3 ♂♂	12-12.5	76.5-79	39.5-45 mm.
1 ♀	13	76	moult.—H. W.]

The Ashy-crowned Finch-Lark is common and resident in the drier portions of the low country in Travancore and Cochin. To some extent it may be locally migratory. Ferguson says (*J.B.N.H.S.,* xv, 473) that at Cape Comorin it is fairly common throughout the year. 'In the dry weather it frequents the paddy fields about Trivandrum, but disappears when the rains come on.' Mr. Pillai, however, obtained specimens on the Trivandrum Beach in July.

It affects dry stubble fields, fallow land and laterite country in the neighbourhood of cultivation, and is also partial to the sparse grass-covered sandy stretches by the sea in South Travancore. A single pair was observed in dry, terraced paddy fields in the valley at Marāiyūr (3,000 ft.) a locality rather remarkable for its combination of hills and plains features both wet and dry.

Flocks collected every evening to roost on the ground on the scraggy grass-covered laterite plateau adjoining the Travellers' Bungalow at Karūpadanna. With the aid of an electric torch it was revealed that the birds do not sleep huddled together, but squat individually a foot or two apart.

This Finch-Lark is presumably common about the eastern (dry) base of the Palni Hills, and Fairbank (*S.F.*, v, 408) obtained a specimen at Periakulam. In Ceylon it is replaced by the large-billed race *E. g. ceylonensis* Whistler.

Breeding: Specimen No. 912 (27 November) had testes enlarged to 7×5 mm. and it was obviously breeding. This also appeared to be the case with No. 522 (7 April—testes 6×4 mm.) which was in fresh plumage and had an incubation patch. No. 552 (9 April)—a downy chick—was taken from a nest containing a second nestling in the same stage. The nest was a shallow depression sparsely lined with grasses, under shelter of a clod on fallow land. During the whole of the Survey period—November to May—males were observed in their courtship aërobatics and chasing off rivals or intruders. Nesting operations, however, probably extend over most months of the year in this area.

FAMILY: ZOSTEROPIDÆ.

Zosterops palpebrosa nilgiriensis Ticehurst. The Nilgiri White-eye.

Specimens collected: 91 ♀ 14-1-33 Marāiyūr 3,500 ft.; 130 ♂, 131 ♀ 23-1-33 Sānthanpāra 3,500 ft.; 980 ♀ 14-12-33 Pādagiri 3,000 ft.

Elsewhere noted at: Mūnnār (5,000 ft.); Peermade (3,200 ft.); Camp Derāmalāi (3,000 ft.—Panthalam Hills); Balamore Estate (2,000-4,000 ft. Ashāmbu Hills).

Colours of bare parts: Iris buffy hazel brown; bill horny-brown, grey at gape and chin; legs and feet slaty-grey; claws brown.

[Measurements:

	Bill.	Wing.	Tail.	Tarsus.
1 ♂	13.5	56.5	39	16.5 mm.
3 ♀♀	14-15	53-56	38-41	16-16.5 mm.

These four specimens confirm the fact that *nilgiriensis* is a good race. In colour they are much darker more saturated above, while the flanks and sides of the breast are washed more heavily with grey than in either the typical race or *Z. p. occidentis*.

It is interesting to note that the two specimens shot on 23-1-33 are in moult, both finishing their body moult and beginning the tail moult. This is presumably the post-nuptial moult as in a large series of *Z. p. occidentis* I find that there is no pre-nuptial moult and the post-nuptial moult takes place from July to November.—H. W.]

Ferguson (*J.B.N.H.S.*, xv, 263) correctly describes the White-eye as confined to the hills in Travancore, and his description applies to its status in Cochin as well. The Surveys nowhere came across this species below 1,500 ft. and the highest elevation at which it was met was 7,500 ft.

It is a resident, and not uncommon is suitable facies. It frequents evergreen sholas, moving about restlessly in flocks which systematically search the foliage for insects, both in bushes as well as up in the tree-tops. They are also commonly observed springing open and probing with their bills into *Loranthus* flowers for the nectar, and the birds must play an important part in cross-pollinating them as I have found by a microscopic examination of the pollen adhering to their chin and forehead. *Erythrina* shade trees in tea, coffee and cardamom plantations when in bloom are also regularly visited for the nectar and derive similar benefit. The flocks often form part of the localised bird associations in forest. I have noted in the field that some of the jingling notes which the birds constantly keep up are curiously reminiscent of the laugh of the woodpecker *Chrysocolaptes guttacristatus*—of course in miniature.

From what Terry writes (*S.F.*, x, 478) the White-eye is apparently common on the Palni Hills. It is represented in Ceylon by the race *Z. p. egregia* and also by a very closely allied species *Z. ceylonensis* which is confined to the hills over about 3,000 ft.

Breeding: The male shot on 23 January (No. 130) had testes enlarged to 5×4 mm. It was in moult, however, which Mr. Whistler presumes was post-nuptial (cf. supra) meaning therefore that the bird had lately finished breeding (?). The gonads of the other three specimens were undeveloped and no other direct evidence in this regard was obtained by the Surveys. According to Ferguson, the breeding season in Travancore is April and May. That the birds also breed later on in the year—in December or January—is suggested by the above specimen.

Terry found a nest with young at Kukal in the Palni Hills in May.

FAMILY: NECTARINIDÆ.

[**Æthopyga siparaja vigorsi** (Sykes). Vigor's Yellow-backed Sunbird.

Nidification (iii, 205) after giving the distribution of this Sunbird as extending from Bombay and Poona to the south of Travancore, states: 'As Stewart found three young in a nest on 8 June, it would appear that the breeding season (in Travancore) starts in the middle of May and continues up to the end of September.'

Neither the Surveys nor any of the other observers in Travancore, Cochin, Palni Hills or in the immediately neighbouring areas record meeting this species, and therefore the temptation is irresistible to accept the verdict of the Eastern Ghats Report (*J.B.N.H.S.*, xxxvii, 282) that the distribution in the *Fauna* (iii, 382) as well as *Nidification* is inaccurate. One would very much like to have further particulars of the nest alleged to have been found by Stewart and also to learn whether the nestlings or their parents have been preserved and confirm his identification.]

Cinnyris lotenia (Linnaeus). Loten's Sunbird.

Specimens collected: 70 ♂ 12-1-33 Marāiyūr 3,500 ft.; 694 ♀ 20-7-33 (Thirūmalāi 120 ft.); 717 ♂ 24-7-33 (Marūthānkūzhi 50 ft.); 816 ♂ 9-8-33 (Nettayam 200 ft.); 835 ♂ 11-8-33 (Pūlayanārkotta 200 ft.) Trivandrum Environs.

Elsewhere noted at: Thattākād. Other sight records not given owing to possible confusion with *C. asiatica*.

Colours of bare parts: Iris brown or reddish-brown; bill, legs, feet and claws horny-black; mouth pinkish-brown.

[Measurements:

	Bill.	Wing.	Tail.	Tarsus.
4 ♂♂	27-28.5	56.5-58.5	36-39	15-15.5 mm.
1 ♀	28.5	55.5	34.5	14.5 mm.

Additional specimen examined:

Brit. Mus. Coll.: ♂ ad. 5-6-77 eastern base of Palnis (Fairbank).

This Sunbird has no eclipse plumage. The juvenile male is exactly like the adult female and can only be distinguished by the shorter bill (25 mm.) and softer feathers. There is a complete post-juvenal moult to adult dress (*vide* Ticehurst, *Ibis*. 1935, p. 195).—H. W.]

Loten's Sunbird is a fairly common resident species in the low country of Travancore and presumably also in Cochin whence, however, the Survey unfortunately procured no specimens or undoubted sight records. According to Ferguson (*J.B.N.H.S.*, xv, 473) it ascends the hills to 2,000 ft.

Sunbirds in Travancore and Cochin were invariably noted as the most regular visitors to *Loranthus* clumps in flower, moving about restlessly among the clusters of buds, squeezing their tips to spring them open, probing into the flower tubes for nectar with their perfectly adapted bills and assisting in their cross-fertilisation by transferring the pollen adhering to their forehead, throat or bill on to the mature stigmas of other blossoms. Numerous other species of flowers are also visited, *Lantana, Erythrina* and *Bombax* being amongst the commonest.

We have no definite information concerning the status of this species in the Palni Hills, but it would appear that it does not ascend them to any height. Fairbank (*S.F.*, v, 399) obtained a male at their eastern base and did not see another during his stay (up). It is found in Ceylon where it is said to ascend the hills up to 3,000 ft.

Breeding: The testes of No. 70 (12 January) were enlarged to 5×4 mm. It was in perfect metallic plumage. The testes of No. 717 (24 July) measured 7×6 mm. and those of 835 (11 August) 6×4 mm. The ovarian follicles of 694 (20 July) were enlarged. All these specimens were likewise in fresh plumage and manifestly breeding. According to Stewart and Bourdillon (*Nidification*, iii, 214), this Sunbird breeds in Travancore principally from January to April and on into May. The evidence we have procured is somewhat confusing in view of that statement, but it certainly suggests that as in many other Travancore species the breeding season is not well-defined and probably extends over a protracted period.

Cinnyris asiatica asiatica (Latham). The Indian Purple Sunbird.

Specimens collected: 403 ♂ 5-3-33 Kūmili 3,000 ft.; 592 ♂ 13-4-33 Cape Comorin ca. S.L.; 896 ♂ 24-11-33 Wadakkāncheri 400 ft.; 989 ♂ 16-12-33 Pādagiri 3,000 ft.

Elsewhere noted at: Munro Island (Vembanād Lake, Kottāyam Backwaters); Rājampāra (1,350 ft.); Trivandrum; Nemmāra (300 ft.). In these sight records, the possible confusion with *C. lotenia* must be borne in mind.

Colours of bare parts: Iris brown or orange-brown; bill, legs, feet and claws brownish-black; mouth brownish-pink or slaty-pink.

[Measurements:

	Bill.	Wing.	Tail.	Tarsus.
4 ♂♂	19.5-21	55-58	33-35.5	14.5-15.5 mm

Additional specimen seen: *Brit. Mus. Coll.*: ♂ 15-1-75 Kalland Kharmi (?) South Travancore (Bourdillon).

The adult male moults by a complete post-nuptial moult from the metallic plumage into the eclipse in late June and July and moults back again to full plumage about November. In eclipse the broad black line from the throat to the breast, with its metallic gloss, the black wings with their metallic coverts and the metallic wash on the tail easily distinguish this plumage from that of the female.

The immature male and female are alike and similar to the adult female plumage, but I am not quite sure when the metallic plumage is first assumed by the male.—H. W.]

Like the last, the Purple Sunbird is also a fairly common resident species in the Travancore-Cochin area. I have no record of its occurring above 3,000 ft., but it was not uncommon about that elevation. At Kūmili and in the neighbourhood of the Periyār Lake it was constantly observed probing for nectar into the blossoms of *Gmelina arborea*, a common tree in deciduous forest there and flowering generally in March. It also frequents gardens and compounds in villages and towns, both large and small.

According to Fairbank (*S.F.*, v, 399) it is common at the base of the Palni Hills. It is a resident in Ceylon.

Breeding: No. 896 (24 November) was in fresh metallic breeding dress with testes enlarged to 5×3 mm. In No. 403 (5 March) in like plumage the testes measured 6×4 mm. The other two males (16 December and 13 March) were in intermediate plumage with undeveloped gonads. T. F. Bourdillon (*J.B.N.H.S.*, xv, 473) describes eggs taken in Travancore but is silent as regards the breeding season there. From the evidence provided by the Survey specimens it appears that breeding commences, at least, by the latter half of November, but how long it continues is not known.

Cinnyris minima (Sykes). The Small Sunbird.

Specimens collected: 206 ♂, 207 ♀ 3-2-33 Thattākād 200 ft.

Elsewhere noted at: Marāiyūr (at 7,000 ft.); Sānthanpāra (3,500 ft.);

Ūrūmbikera Reserve Forest, near Mūndakāyam (ca. 1,000 ft.); Peermade (3,200 ft.); Kūmili (ca. 3,000 ft.); Balamore Estate (2,000 ft.—Ashāmbu Hills); Kuvallé Incline, Cochin Forest Tramway; Pādagiri (3,000 ft.—Nelliampathy Hills).

Colours of bare parts: Iris brown; bill, legs, feet and claws in male blackish-brown, in female somewhat paler. Mouth (in female only) yellowish near gape otherwise greyish-pink.

[Measurements:

	Bill.	Wing.	Tail.	Tarsus.
1 ♂	15.5	49	30	13 mm.
1 ♀	14.5	45	27	— mm.

Additional specimens seen:

Brit. Mus. Coll.: ♂ 18-5-77 Painkad 4,000 ft., Lower Palnis (Fairbank); ♀ 15-6-77 Tandagudi 4,000 ft., Lower Palnis (Fairbank); ♂ no data, ♂ 13-1-76 Mynall, Travancore (Bourdillon).

The male has an eclipse plumage in which it becomes like the female except that the metallic colours are retained on the lower back, rump and upper tail coverts. This is assumed about April or early May and is retained through June, the moult to the full metallic plumage taking place again before August. The young male and female are alike and similar to the adult female, though rather yellower below. The young male attains the metallic adult plumage by a complete moult about May.—H. W.]

The Small Sunbird is common in the hills of Travancore and Cochin. Thattākād (200 ft.) at the foot of the High Range is the lowest elevation at which the Surveys came across it, the highest being Kūmarikkāi Malāi 7,000 ft. (above Marāiyūr). Here the birds were met with on the outskirts of a small shola. This Sunbird prefers well-wooded country and generally speaking is inseparable from evergreen forest or its close proximity. I did not observe it at all anywhere near the backwaters or in the low plains country about the coast. Mr. K. K. Nayar, Professor of Zoology, Maharaja's College, Ernakulam, has, however, recently recorded it (*J.B.N.H.S.*, xxxvii, 730-32) breeding at Ernakulam. Unfortunately he did not collect a specimen, but in reply to my doubts assures me of the correctness of his identification. This record, if authentic, must undoubtedly be considered a very exceptional one.

I found the Small Sunbird very partial to the blossoms of *Erythrina lithosperma* shade trees in tea and coffee plantations and it was of course invariably present on *Loranthus* clumps in flower. At Balamore Estate the flowers of *Duranta plumieri* planted as a hedge along the path from the tea factory to the Travellers' Bungalow attracted numbers of these sunbirds.

The courtship song of the male consists of a feeble, squeaky *see-swee, see-swee, see-swee* etc. uttered from a branch in the proximity of the female, to the accompaniment of a restless pivoting this way and that the while.

In the Palni Hills, Fairbank (*S.F.*, v, 398) found this species common from 4,000 ft. elevation to the top of the hills. It is locally distributed in Ceylon.

Breeding: On 12 December (Nelliampathy Hills, Cochin) a female was observed carrying a strip of fibre in her bill. She was escorted by the male who was singing. Most males at this time were noted as being in fresh breeding dress. The specimens (3 February) appeared to be breeding or about to breed. The testes of the male measured 5×4 mm., the ovarian follicles of the female being about 1 mm. in diameter. The former was in fresh breeding plumage, and the latter just completing pre-nuptial moult.

According to Ferguson, the breeding months in Travancore are December and January. *Nidification* (iii, 225) gives the breeding season in Ceylon and Travancore as February, March and April, and in Kanara as December to April.

Cinnyris zeylonica (Linnaeus). The Purple-rumped Sunbird.

Specimens collected: 100 ♂ 15-1-33 Marāiyūr 3,500 ft.; 591 [♀] 13-4-33 Cape Comorin ca. S.L.; 693 ♀ 20-7-33 (Thirūmalāi 120 ft.); 746 ♂ 29-7-33 (Kūttāni 300 ft.); 778 ♂ 2-8-33 (Kovālam ca. 70 ft.); 792 ♀ 5-8-33 (Poojappūra 140 ft.); 814 ♀, 819 ♀ 9-8-33 (Nettāyam 200 ft.); 844 ♂ 13-8-33 (Veli) Trivandrum Environs; 957 o? 8-12-33 Nemmāra 300 ft.

Elsewhere noted at: Thattākād (200 ft.); Kottāyam (ca. S.L.); Arāmboli (250 ft.); Chālakūdi; Trichūr; Karūpadanna (ca. S.L.).

Colours of bare parts: Iris orange-brown or reddish-brown; bill, legs, feet and claws horny-black; mouth brownish-pink (in some, yellowish pink).

[Measurements:

	Bill.	Wing.	Tail.
5 ♂♂	17-18	55.5-56.5	33.5-36 mm.
6 ♀♀	16-17	51-54.5	30-31.5 mm.

Additional specimens seen:

Brit. Mus. Coll.: ♀ 25-2-80 Quilon (Bourdillon); ♀ juv. 6-6-77 Periakulam, Palnis (Terry).

B.N.H.S. Coll.: ♂ 27-8-93 Thekadi (Cook).

This species has no eclipse plumage. The post-juvenal moult is complete and the young male goes straight into the metallic plumage. The juvenile male and female are alike and closely resemble the adult female in fresh plumage when the upper parts are greenish olive with the chin and throat pale yellow. In worn plumage the upper parts of the female fade to earthy-brown. The female of *zeylonica* may be distinguished from the female of *asiatica* by

(1) shorter bill;

(2) chin and throat and flanks are white, or in fresh plumage the chin and throat are white with a yellowish wash, contrasting with the yellow of the abdomen;

(3) golden olive edges to the wing quills.—H. W.]

The Purple-rumped Sunbird is a common resident species in Travancore and Cochin. Except at Maraiyūr—a locality peculiar in its mingling of hills and plains forms—it was met with only in the low country, and up to not more than about 300 ft. elevation. Ferguson (*J.B.N.H.S.*, xv, 474) also saw it in the low country in Travancore and never on the hills. The general impression conveyed by the *Fauna* (iii, 408) that it ascends the Palnis up to 2,500 ft. and is found up to 3,000 ft. in Travancore therefore needs modification. It has, moreover, a decided predilection for dry and deciduous country, a fact which was clearly evident in the case of Thattākād. Along the old High Range road in this locality where heavy evergreen forest occurs, only *Cinnyris minima* was met with, whereas a few miles down the Periyār River below the Travellers' Bungalow where open deciduous secondary jungle occurred, the Purple-rumped Sunbird completely replaced it.

It has the usual sunbird habits. Nectar of *Calycopteris floribunda*, *Lantana camara*, *Loranthus* (*loniceroides* ?) and *Moringa oleifera* is largely eaten, and in the gardens the exotic *Russelia juncea* is an unfailing attraction to the birds.

It apparently does not ascend the Palni Hills. Fairbank (*S.F.*, v, 398) obtained a pair at the eastern (dry) base of the hills and observed a few others there, but thought they were probably more abundant around gardens in the plain. It is a resident in Ceylon.

Kinloch writing of the Nelliampathy Hills (*J.B.N.H.S.*, xxvii) says: 'I believe this (Purple-rumped) to be our only sunbird. Very common.' Kinloch's list, however, altogether omits the Small Sunbird, a species which I found to be common about Pādagiri to the exclusion of others. To my mind there is no doubt that this is a case of mistaken identity and that his note in reality relates to *C. minima*.

Breeding: On 23 December a nest was discovered hanging about 4 ft. up in a potted croton within 4 yds. of the Residency Palace at Trichūr. Motor cars constantly drove past or stopped within arm's length of it, and malis sprayed water on the crotons twice a day. The nest was the usual rounded pear of fibres with pieces of bark and caterpillar droppings on the outside. It contained c/2 which the female was brooding complacently. Another similar nest was observed at Karūpadanna on 28 December, suspended from the tip of a *Pandanus* leaf arching over a constantly used foot-path on the edge of paddy fields. The male was in the proximity, the hen within.

The testes of the July-August males were enlarged from 4×3 mm. to 5×4 mm. and the ovarian follicles of the females from 1 to 4 mm. in diameter. They were all in fresh plumage at the time, and some at least undoubtedly breeding.

Ferguson says that in Travancore they breed in February and March. *Nidification* (iii, 227) gives the breeding season as February to April while the evidence now procured by the Surveys suggests that the season is by no means so short or so well-defined.

Arachnothera longirostra longirostra (Latham). The Little Spider-hunter.

Specimens collected: 125 ♂ 22-1-33, 133 ♂ imm. 23-1-33, 143 ♀ imm. 24-1-33 Sānthanpāra 3,500 ft.; 472 ♂ 19-3-33 Rājampāra 1,350 ft.; 988 ♂ 16-12-33 Pādagiri 3,000 ft.

Elsewhere noted at: Thattākād (200 ft.); Ūrūmbikera Reserve Forest (ca. 1,000 ft.—near Mūndakāyam); Peermade (3,200 ft.); Kūmili (3,000 ft.); Camp Derāmalāi (3,000 ft.); Balamore Estate (2,000 ft.—Ashāmbu Hills); Kuvallé Incline—Cochin Forest Tramway; Kūriārkūtti (1,600 ft.—Annemalāi Hills).

Colours of bare parts: Iris brown; bill horny-brown, plumbeous at chin and on gonys; mouth greyish-pink with brown mottling; legs, feet and claws bluish-plumbeous. In 143 (♀ imm.) legs greyish-blue, feet parti-coloured yellow and blue.

[Measurements:

	Bill.	Wing.	Tail.	Tarsus.
4 ♂♂	34-36.5	64-66.5	40-41	15 mm.
1 ♀	32.5	59	36.5	14.5 mm.

Additional specimens examined:

Brit. Mus. Coll.: ♂ 16-6-77 Periur woods 4,000 ft., Lower Palnis (Fairbank); ♀ 17-6-77 Pundegude 1,000 ft., Lower Palnis (Fairbank); ♂ juv. 9-2-80, ♀ 24-11-77 Mynall (Bourdillon); ♂ 5-4-79 Eridge, Travancore (Bourdillon).

H. Whistler Coll.: o? 23-10-23 Nelliampathies (Kinloch).

The immature male and female are exactly alike and cannot be distinguished from adults.—H. W.]

The Spider Hunter is a typical dweller of evergreen forests, and in this biotope it is found fairly commonly in Travancore and Cochin, both in the low and foothills country as well as in the hills—in our experience—up to at least 4,000 ft. Ferguson (*J.B.N.H.S.*, xv, 474) met with it to upwards of 5,000 ft. in the High Range. Cardamom sholas with their lofty shade trees are favourite haunts, and Banana plantations adjoining forest homesteads or estate cooly lines almost invariably hold their quota. The birds usually go about in pairs, and often two or more of these may be seen feeding gregariously. In addition to spiders and other insects, their food was found to consist largely of the nectar of flowers into which they probe with their admirably adapted bills and which they undoubtedly help to fertilise. Some of the blossoms observed in regular attendance were those of *Musa* (*sapientum* ?), *Erythrina lithosperma, Mezoneuron cucullatum* and *Sterculia colorata.*

Its harsh calls—*chee-chee*—are very like those of the Paradise Flycatcher (*Tchitrea*) or the Ashy Swallow-Shrike (*Artamus*) but somewhat pleasanter and in a higher key. The song consists of a metallic *which-which-which-which* etc. repeated about once or twice a second without any variation, and is kept up for two minutes or more at a stretch. The volume of sound is somewhat bigger than that of the Purple Sunbird (*Cinnyris asiatica*).

Fairbank (*S.F.*, v, 397) obtained a specimen at Periur (4,000 ft.) in the Palni Hills and its status there is presumably the same as in Travancore and Cochin. Curiously enough it does not occur in Ceylon.

Breeding: Between December and March at least the breeding season was certainly in progress. Specimen No. 988 (16 December) had its testes enlarged to 10×5 mm. It was in fresh plumage and singing excitedly. In No. 125 (22 January) the testes measured 6×4 mm. and in 472 (19 March) 4×3 mm. From the fresh plumage of these specimens moreover, and from the general behaviour of the birds at the time—singing and chasing each other etc.—it was clear that they were breeding or about to breed. Nos. 133 (23 January) and 143 (24 January) were immature with imperfectly ossified skulls, indicating that they had hatched a month or two before. The season is apparently a protracted one. According to *Nidification* (iii, 235) Stewart and Bourdillon took eggs in Travancore from 7 March up till the end of May.

FAMILY: DICÆIDÆ.

Dicæum concolor concolor Jerdon. The Nilgiri Flower-pecker.

Specimens collected: 171 ♂ 28-1-33 Sānthanpāra 3,500 ft.; 290 ♂ 16-2-33 Kottāyam ca. 100 ft.; 442 ♂ 16-3-33 Rājampāra 1,350 ft.

Elsewhere noted at: Thattākād (200 ft.); Kūmili and Periyār Lake Environs (3,000 ft.); Tenmalāi (500 ft.); Trivandrum; Balamore Estate (2,000 ft. —Ashāmbu Hills); Kūriārkūtti (1,600 ft.); Pādagiri (3,000 ft.—Nelliampathy Hills).

Colours of bare parts: Iris brown; bill bluish-grey, dark horny-brown on culmen; mouth grey, brownish and pink; legs, feet and claws brownish-black.

[Additional specimens seen:

Brit. Mus. Coll.: ♂ 23-6-77, ♀♀ 31-5-77 Kodaikanal 7,000 ft., Palni Hills (Fairbank); ♀ 1-8-00 Ponmudi, Travancore (Ferguson).

Sparrow Coll.: ♂ juv. 14-3-14 Cardamom Hills.

Measurements:

	Bill.	Wing.	Tail.	Tarsus.
3 ♂♂	12.5-13	48-50.5	23.5-25.5	12.5 mm.
1 ♀	12	47	—	— mm.

The juvenile is similar to the adult in plumage. No. 290 *might* be *D. erythrorhynchos*. It has the beak of the latter and the colour of the former.—H. W.]

The Nilgiri Flowerpecker is a common resident species in the Travancore-Cochin area. It frequents deciduous as well as mixed deciduous-and-evergreen forest, as also clearings in and about plantations, and groves of trees in the vicinity of villages. The Surveys came across it from the low country up to about 4,000 ft. elevation, but it has a decided preference for the foothills country and the hills up to 2,500 ft. It was invariably observed on *Loranthus* clumps, and indeed the presence of the plant parasite in any locality was the surest indication of the presence of Flowerpeckers. These birds feed largely on the nectar of the flowers and on its ripe berries, and constitute perhaps the most important agency in the fertilisation of its blossoms and the dissemination of its seed. Mango and Nelli trees (*Phyllanthus emblica*) were universally parasitized by *Loranthus longiflorus* Desr. and other species, who have, in addition, a large number of hosts besides. At Nemmāra, teak trees in the Government forest were heavily infested.

I found the voice and notes of this species indistinguishable from those of Tickell's Flowerpecker.

It is common in the Palni Hills. Fairbank (*S.F.*, v, 399) obtained specimens at Kodaikanal, 7,000 ft. It does not extend to Ceylon.

Breeding: The testes of two of the specimens namely No. 171 (28 January) and 290 (16 February) measured 3×2 mm. and appeared to be maturing. The latter was completing pre-nuptial moult on the secondaries and rectrices. In the specimen collected on 16 March the organs were in a quiescent state. No other evidence as regards breeding was obtained by the Surveys. Col. Sparrow collected a juvenile in the Cardamom Hills on 14 March (1914). According to Stewart and Bourdillon, the normal breeding months in Travancore are March to May (*Nidification*, iii, 243).

Dicæum erythrorhynchos erythrorhynchos (Latham). Tickell's Flowerpecker.

Specimens collected: 590 ♂ 13-4-33 Cape Comorin ca. S.L.; 689 ♀ 18-7-33 (Pūlayanārkotta 200 ft.); 707 ♀ 22-7-33 (Pattom 50 ft.); 786 o? 4-8-33 (Cattle Farm); 842 ♂ 12-8-33 (Beach) Trivandrum Town and Environs; 938 ♀ 4-12-33 Nemmāra 300 ft.; 1048 ♀ juv. 31-12-33 Karūpadanna ca. S.L.

Elsewhere noted at: Kottāyam (ca. S.L.); Peermade (3,200 ft.)—both doubtful with *concolor;* Kūriārkūtti (1,600 ft.); Wadakkāncheri (400 ft.); Pādagiri (3,000 ft.); Trichūr; Cranganour Fort.

Colours of bare parts: *Adult*: Iris hazel brown; bill pale horny brown, pinkish flesh-colour at gape and on lower mandible excepting tip; mouth pale pink; legs, feet and claws dark slate. *Juvenile* (1048): Iris hazel brown;

bill orange-yellow, dusky on upper mandible and tips; gape and mouth orange-yellow; legs and feet slate; claws horny-brown.

[Measurements:

	Bill.	Wing.	Tail.	Tarsus.
2 ♂♂	12	49-52	23.5-25	12.5 mm.
4 ♀♀	13	48.5-50	23.5-24.5	— mm.

Additional specimens seen:

Brit. Mus. Coll.: ♂ 23-3-76 Palnis (Fairbank); ♂ 5-6-77 Periakulam, eastern base of Palnis (Fairbank); ♀ 14-5-94 Ponmudi 3,500 ft.—Travancore (Nair).

The juvenile is similar to the adult in plumage.—H. W.]

Tickell's Flowerpecker is a common resident species in the low country of Travancore and Cochin. The Surveys' sight records from the hills, being unsupported by specimens, must be accepted with some reserve considering how easy it is to confuse this with the foregoing species in the field. Indeed, it is not always a simple matter to tell the one from the other even in the hand (*vide* Specimen No. 290 under *concolor*). On the whole, however, my impression is that as a general rule Tickell's Flowerpecker is not met with in the higher hills, although of course both do at times occur in the same localities lower down. It is inseparable from *Loranthus* whose flowers it probes into for nectar and cross-fertilises, and whose seed it disperses. *Viscum* clumps are similarly attended and the guts of a specimen shot off one of these contained no less than 27 of the viscous seeds, each measuring ca. 3×2 mm., and some on the point of being extruded from the vent.

In the Palni Hills, according to Fairbank (*S.F.*, v, 399) it is sometimes observed on the hillsides, but is common in the adjacent plains. In Ceylon it is represented by an endemic race—*ceylonensis*—which is much darker-coloured above.

Breeding: Specimen No. 1048 (31 December) was a juvenile lately out of nest and still attended and being fed by its parents. Three of the specimens collected by Pillai (18 July and 4 August) were immature with imperfectly ossified skulls. The gonads in the rest of the specimens were in non-breeding condition.

Ferguson (*J.B.N.H.S.*, xv, 474) had a nest from Trivandrum brought to him on 16 March containing two young birds and one 'fresh' egg! The breeding season in this area appears to be ill-defined and an extended one. The *Fauna* (iii, 432) gives the general season as February to June, but says that they often have two broods in the year.

Piprisoma agile agile (Tickell). The Thick-billed Flowerpecker.

Specimen collected: 1 ♂ 4-1-33 Marāiyūr 3,500 ft.

Elsewhere noted at: Peermade (3,200 ft.); Nemmāra (300 ft.—base of Cochin Nelliampathies).

Colours of bare parts: Iris brownish-orange; bill plumbeous, darker on culmen; mouth pinkish-brown; tongue yellow; legs and feet slaty-brown.

[The specimen measues: Bill 10, wing 62, tail 31.5, tarsus 13.5 mm.

This is a new record for the Travancore list, the bird not having been recorded previously in India south of the Nilgiris though it has a local distribution in Ceylon.—H. W.]

The Thick-billed Flowerpecker is a rather uncommon and locally distributed species in our area. It has not been recorded by previous observers in Travancore, Cochin or the Palni Hills. It was noted as fairly common (not abundant) in and about deciduous forest and in the neighbourhood of cultivation in the localities named. The bird was oftenest seen on *Loranthus* and *Viscum* clumps where laden with ripe berries, and usually also on Peepal (*Ficus religiosa*) trees in fruit. It feeds extensively on both these and along with the other Flowerpeckers is largely responsible for the dispersal and propagation of the nefarious plant parasites. Owing, however, to its habit of revolving the ripe berries in its thick finch-like bill to strip them of the edible epicarp and of wiping off the sticky seeds on to adjoining branches—seldom swallowing them entire—it perhaps helps to spread the parasite over the same host more than in its dispersal farther afield to neighbouring trees.

The call notes, *chick-chick-chick* etc., resemble those of both the Nilgiri and Tickell's Flowerpeckers, but nevertheless are distinct enough to be easily diagnostic.

Breeding: The testes of the specimen measured 5×3 mm., and considered along with its fresh plumage suggested that it was preparing to breed shortly. No other evidence in this regard was obtained. According to the *Fauna* (iii, 435) over the rest of its range, this Flowerpecker breeds from February to April in the plains, and from April to June in the hills up to about 6,000 ft. and rarely up to 7,000 ft.

SUB-ORDER: ANISOMYODI.

FAMILY: PITTIDÆ.

Pitta brachyura (Linn.). The Indian Pitta.

Specimens collected: 98 ♂ 15-1-33 Marāiyūr 3,500 ft.; 635 ♀ 21-4-33 Arāmboli 250 ft.; 895 ♀ 24-11-33 Wadakkāncheri 400 ft.

Elsewhere noted at: Mūnnār (5,000 ft.—Kanan Devan Hills); Sānthanpāra (3,500 ft.—Cardamom Hills); Thattākād (200 ft.); Kottāyam (ca. S.L.); Peermade (3,200 ft.); Kūmili and Periyār Lake Environs (3,000 ft.); Rājampāra (1,350 ft.—Panthalam Hills); Tenmalāi (500 ft.); Trivandrum (ca. S.L.); Kūriārkūtti (1,600 ft.—Annemalai Hills); Nemmāra (300 ft.); Pādagiri (3,000 ft.—Nelliampathy Hills); Karūpadanna (ca. S.L.).

Noted as absent in the Ashāmbu Hills (2,000-4,000 ft.) between 22 and 29 April.

Colours of bare parts: Iris brown; bill brown with orange tinge, brighter orange at gape and on basal half of lower mandible; mouth brownish, yellow and pink; legs and feet pinkish flesh-colour; claws duskier.

[Measurements:

	Bill.	Wing.	Tail.	Tarsus.
2 ♂♂	23	108-110.5	36-39.5	35-38.5 mm.
2 ♀♀	24-25	106-107	39	35-35.5 mm.

Additional specimens seen:

Brit. Mus. Coll.: o? -3-75 Eridge (Hume Coll.); ♂ 30-12-79 Kallaur Road (Bourdillon); ♂ no date Mynall (Hume Coll.). Also four birds from Trivandrum (Fry).

The post-nuptial moult is complete and takes place from August to September. There is no spring moult.—H. W.]

The Pitta is apparently a winter visitor to Travancore and Cochin where the Surveys found it common. The last date on which it was noted was 21 April. It was common at this time in the scrub under the Babool groves and light deciduous jungle in the Arāmboli Gap, but curiously enough none were heard or seen during the next week in the Ashāmbu Hills at between 2,000 and 4,000 ft. elevation.

The birds were partial to mixed bamboo forest, scrub jungle, overgrown ravines etc. both deciduous and evergreen, and were met with in the neighbourhood of plantation cooly-lines and on the outskirts of towns and villages as well as far away from human habitations. Their whistling calls invariably gave the first indication of their presence in any locality. These consist of two long-drawn notes, *weet-teew*, repeated without variation every five seconds or so, sometimes for well over 15 minutes at a stretch. The birds reply to one another for considerable periods, often three or four calling from different directions simultaneously. They are amongst the earliest risers and may usually be heard soon after the first Whistling Thrush (*Myophonus*) has proclaimed to slumbering bird-dom the inky greyness of approaching dawn. They call principally in the mornings and evenings, frequently till well after dusk. Besides the double whistling notes, they have several harsh monosyllabic *chee*-s and *mew*-s.

When disturbed off the ground where it usually feeds, the Pitta flies up into overhanging branches of trees and very deliberately and slowly wags its stumpy tail up and down like a wagtail in 'slow motion'.

The bill and feet of a specimen shot in the vicinity of Marāiyūr village were coated with human ordure and its stomach contained a mass of maggots —presumably of the Blue-bottle Fly (*Musca vomitoria* ?)—along with some of the human excreta whence it had obtained them.

There seems to be nothing on record concerning this bird in the Palni Hills, but its status there is doubtless the same as in the Travancore and Cochin ranges. It is a winter visitor also to Ceylon. The gonads of the specimens showed no departure from the normal non-breeding condition.

ORDER: CORACIIFORMES.

SUB-ORDER: PICI.

FAMILY: PICIDÆ.

Picus xanthopygæus (Gray). The Little Scaly-bellied Green Woodpecker.

Specimens collected: 95 ♂ 14-1-33 Marāiyūr 3,500 ft.; 175 ♀ 28-1-33 Sānthanpāra 3,500 ft.; 260 ♀ 10-2-33 Thattākād 200 ft.; 624 ♀ 19-4-33 Arāmboli 250 ft.

Elsewhere noted at: Kūriārkūtti (1,600 ft.—Annemalāi Hills).

Colours of bare parts: Iris pinkish-white with inner ring of brownish-red; bill horny slate, pale yellow at sides of lower mandible except tip; mouth greyish-pink; legs and feet greyish sage green; claws horny.

[Measurements:[1]

	Bill.	Wing.	Tail.	Tarsus.
1 ♂	36	132	88	25 mm.
3 ♀♀	31.5-34	124.5-128	78-88	22.5-24 mm.—H. W.]

The Surveys came across the Scaly-bellied Green Woodpecker from about 200 to 4,000 ft. elevation in Travancore and Cochin. In our experience it was certainly commoner than Ferguson's note (*J.B.N.H.S.*, xv, 654) would suggest, though sparingly distributed and nowhere numerically abundant. This woodpecker frequents mixed bamboo and deciduous forest with sometimes an intermingling of evergreen species. It eschews heavy jungle and keeps to open, lightly wooded country, rubber and cocoanut plantations and the like, usually singly or in pairs.

It is evidently not uncommon in the Palni Hills whence both Fairbank and Terry recorded it at Periur, Pulungi and Pittur. It also occurs in Ceylon, but is said to be rare.

Breeding: In specimen No. 95 (14 January) the testes appeared to have just commenced enlarging. The larger measured about 3×2 mm. No. 175 (28 January) had ovarian follicles enlarged to about 2 mm. in diameter and the bird seemed ready to breed shortly. No other data was obtained and there seems to be nothing recorded about its breeding in this area. At Pittur in the Palni Hills, Terry (*S.F.*, x, 471) once cut out a nest-hole at the beginning of May but it then contained no eggs.

Picus chlorolophus chlorigaster Jerdon. The Southern Indian Small Yellow-naped Woodpecker.

Specimens collected: 264 ♀ 10-2-33 Thattākād 200 ft.; 904 o? 26-11-33 Wadakkāncheri 400 ft.

Elsewhere noted at: Kūmili and Periyār Lake Environs (3,000 ft.); Camp Derāmalāi (3,000-4,000 ft.—Panthalam Hills); Balamore Estate (2,000-3,000 ft. —Ashāmbu Hills).

Colours of bare parts: Iris crimson; bill horny brown or brownish-black, greenish-yellow at sides of base especially of lower mandible; mouth pink; legs and feet greyish-green or dusky olive-green; claws horny.

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[1] Owing to wear, measurements of bills and tails of woodpeckers are to be used always with caution.

[Measurements:

	Bill.	Wing.	Tail.	Tarsus.
1 ♂	26	123.5	81.5	19.5 mm.
1 ♀	26	120.5	77.5	20.5 mm.

Additional specimens seen:

Brit. Mus. Coll.: ♀ 13-3-75, ♀ not dated Mynall (Bourdillon); ♂ Travancore (Bourdillon); ♀ Travancore (Gould).—H. W.]

The Yellow-naped Woodpecker is a fairly common species in the Travancore-Cochin area. It affects deciduous jungle, the mixed intermediate zone on the edge of evergreen forest and rubber plantations especially in the foothills country, and thence up to an elevation of about 3,000 ft. It is usually met with singly or in pairs. In the absence of any personal observations, I can only repeat Ferguson's quotation (*J.B.N.H.S.*, xv, 655) of F. W. Bourdillon's note: 'It is not noisy except during the breeding season. In February and March the plaintive monotonous call of these birds (which somewhat resembles the breeding call of the common Pariah Kite) may be heard at all hours of the day, as they cling motionless to the topmost bough of some tall forest tree.'

In the Palnis, Fairbank (*S.F.*, v, 396) obtained a male near Periur but is silent as regards the status of this species in those hills. In Ceylon it is represented by the race *P. c. wellsi*.

Breeding: The November specimen showed no gonadal development, but No. 264 (10 February) had soft ovarian eggs. Its oviduct was much distended, indicating that the bird was laying.

According to *Nidification* (iii, 280) Stewart took several clutches of eggs in February (earliest 3 February) around Aneichardi Estate (Central Travancore) while Bourdillon took a fresh c/3 in the same district on 8 May. The normal clutch is said to be 2 eggs, c/3 being considered exceptional.

Dryobates mahrattensis mahrattensis (Latham). The Southern Yellow-fronted Pied Woodpecker.

Specimens collected: 542 ♀ 8-4-33 Cape Comorin ca. S.L.; 798 ♀ 6-8-33 Pūlayanārkotta 200 ft.—Trivandrum Environs; 929 ♂, 930 ♀ 1-12-33 Wadakkāncheri 400 ft.

Elsewhere noted at: Marāiyūr (3,500 ft.); Trivandrum Town; Nemmāra (300 ft.).

Colours of bare parts: Iris reddish-brown; bill pale horny grey, brownish on culmen and tips; mouth pinkish-grey; legs, feet and claws brownish-slate.

[Measurements:

	Bill.	Wing.	Tail.	Tarsus.
1 ♂	26	96.5	55	19 mm.
3 ♀♀	22.5-23	97.5-101.5	54-56	18 mm.

The post-nuptial moult is complete and there is no pre-nuptial moult.—H. W.]

This little woodpecker is fairly common in secondary deciduous forest and lightly wooded tracts about cultivation in the low country of Travancore and Cochin. I do not think that Ferguson's description of it (*J.B.N.H.S.*, xv, 654) 'by no means common' is a very happy one. With the exception of Marāiyūr, the Surveys did not meet with it above an elevation of 400 ft. It moves about in pairs usually, but sometimes three or four birds may be seen together, and frequently as members of the localised bird associations or hunting parties.

Fairbank (*S.F.*, v, 395) collected a pair on the Palni Hills and found them not uncommon there up to 5,000 ft. In view of the very different ecological status of this woodpecker in the Travancore-Cochin area, a confirmation of Fairbank's statement seems desirable. The same race is found in Ceylon.

For an excellent paper on the tongue mechanisms of this and certain other Indian woodpeckers, based chiefly on material procured by the Surveys in Travancore and Cochin, the reader is referred to *Journal für Ornithologie*, July 1934, pp. 399-408—'Untersuchungen über den Zungenapparat indischer Spechte' by Joachim Steinbacher.

Breeding: The gonads of the specimens gave no indication as regards the nesting season, and no other evidence was obtained. There are evidently no published records of its breeding in our area.

Dryobates hardwickii cinereigula (Malherbe). The Malabar Pigmy Woodpecker.

Specimens collected: 370 ♂, 371 ♀ 27-2-33, 400 ♀ imm. 5-3-33 Kūmili 3,000 ft.; 1000 ♂ 20-12-33 Pādagiri 3,000 ft.

Elsewhere noted at: Nemmāra (300 ft.).

Colours of bare parts: *Adult*: Iris pale lemon yellow; skin round eye dull magenta; bill horny grey, brownish on culmen; legs and feet brownish-slate; claws horny brown; *Immature* (No. 400): Iris olive; bill horny brown, paler (greyish) at chin and basal two-thirds of lower mandible; mouth greyish-pink; legs and feet slaty; claws horny brown; soles yellowish.

[Measurements:

	Bill.	Wing.	Tail.	Tarsus.
3 ♂♂	15-16	72.5-74	33.5-35	12.5 mm.
1 ♀	15	77.5	36	13 mm.

Additional specimens seen:

Brit. Mus. Coll.: ♂ 14-6-77 Machur, 4,500 ft.—Lower Palnis (Fairbank); ♀ 18-2-76 Mynall (Bourdillon).

B.N.H.S. Coll.: ♂ -4-98 Vambayam.

In this race in addition to the very dark crown an important character is the lightness of the streaking on the lower parts so that in some specimens the lower parts almost appear unicolorous dirty white.—H. W.]

The Pigmy Woodpecker was found by the Surveys to be not uncommon—though not abundant—in the foothills country from about 300 ft. elevation up to about 3,000 ft. It was observed in pairs in secondary deciduous jungle and also in the intermediate zone between it and evergreen forest, but never actually within the latter. The localised bird associations in this facies frequently included a pair. It feeds on stems of saplings close to the ground and up to moderate heights, and then again high up in the slender branches and twigs near the tops of the lofty trees. I have never observed them on the thick boles of the larger trees. The flowers of *Erythrina lithosperma* shade trees in cardamom, tea and coffee plantations in suitable biotope are regularly visited and probed into for the nectar. A specimen shot in the act of so feeding had a quantity of pollen adhering to its chin feathers.

In the Palni Hills, Fairbank (*S.F.*, v, 396) obtained a specimen and saw another at Machur on the road between the Lower Palnis and Kodaikanal. In Ceylon it is replaced by the race *D. h. gymnopthalmus* to which Ferguson erroneously attributed his Travancore specimens and Hume the one from Machur in the Palnis.

Breeding: In specimen No. 1000 (6 December) the testes had enlarged to 5×3 mm. No. 370 (27 February) had testes measuring 4×3 mm. and in its mate—No. 371—the ovarian follicles were distinctly granular. All these birds were evidently preparing to breed. No. 400 (5 March) was immature, with imperfectly ossified skull. No more precise data as regards breeding in our area is available.

Micropternus brachyrus jerdoni (Malherbe). The Southern Rufous Woodpecker.

Specimen collected: 795 ♀ 6-8-33 Pūlayanārkotta 200 ft., Trivandrum Environs.

Elsewhere noted at: Kūmili (ca. 3,000 ft.—Periyār Lake Environs). I have seen five or six specimens from Travancore in the Trivandrum Museum but without precise data.

Colours of bare parts: 'Iris brownish-red; bill upper mandible horny black, lower mandible white, horny towards the base; mouth greyish pink; legs and feet bluish-green; claws horny black' (Pillai).

[Measurements:

	Bill.	Wing.	Tail.
4 ♂♂	26-29	116.5-120.5	60.5-62.5 mm.
2 ♀♀	27-27.5	116.5-120	62-63 mm.

Additional specimens examined: 7 'Anjango' specimens in British Museum. —H. W.]

The Rufous Woodpecker is evidently rather uncommon in Travancore, and I have no record of it from Cochin. Ferguson (*J.B.N.H.S.*, xv, 655) only saw it in the low country and at the foot of the hills, and thought that it did not ascend them. During the Survey I only came across it once—a single bird—in fairly open deciduous forest at Kūmili. Regarding his specimen also, Pillai notes that it was the first seen by him during twenty days' collecting round Trivandrum. Its call or 'laugh' is a high-pitched *ke-ke-ke-ke* somewhat of the timbre of a Myna's. Elsewhere I have observed this woodpecker clinging to the smooth trunks of banana trees, boring into the soft tissues near the base of the leaves and sucking the sap.

This species has not been recorded from the Palni Hills. The same race *jerdoni* is found in Ceylon.

Breeding: The ovary of the specimen was undeveloped. *Nidification* (iii, 304) states that Stewart obtained eggs of this woodpecker in Travancore in March and April. Two is said to be a normal clutch, but occasionally c/3 is found.

Brachypternus benghalensis tehminæ Whistler. The Malabar Golden-backed Woodpecker.

Specimens collected: 72 ♀ 12-1-33 Marāiyūr 3,500 ft.; 475 ♂ 20-3-33 Rājampāra 1,350 ft. (*Type*); 720 ♀ 24-7-33 (Thirūmalāi 120 ft.); 780 o? 3-8-33 (Kovālam ca. 70 ft.); 794 ♂ 5-8-33 (Poojappūra ca. 140 ft.) Trivandrum Environs; 940 ♀ 4-12-33 Nemmāra 300 ft.; 1033 ♂ 28-12-33 Karūpadanna S.L.

Elsewhere noted at: Kūmili and Periyār Lake Environs (3,000 ft.); Tenmalāi (500 ft.); Trivandrum Town; Kūriārkūtti (1,600 ft.—Annemalāi Hills); Wadakkāncheri (400 ft.).

Colours of bare parts: Iris brown, brownish-crimson or crimson; bill slaty-brown (horny-black), greyish on sides at base of lower mandible; mouth greyish-pink; legs and feet greenish-grey; claws horny-brown.

[Measurements:

	Bill.	Wing.	Tail.	Tarsus.
6 ♂♂	39-43	135.5-151	86-95	25-26 mm.
6 ♀♀	38.5-41	138-149	88-93.5	23.5-25 mm.

There are five specimens from Travancore without proper data in the British Museum.—H. W.]

The Golden-backed Woodpecker is a common and familiar resident species in the low and foothills country of Travancore and Cochin. With the exception of Maraiyur, it was not met with above an elevation of ca. 2,000 ft., usually below 1,000 ft. It affects lightly wooded terrain, cocoanut and rubber plantations and also compounds and groves of trees in and around villages and towns. The fruit gardens about the backwater homesteads are a favourite haunt.

Contrary to our experience at Pādagiri, Kinloch (*J.B.N.H.S.*, xxvii, 941) seems to have found it 'very common' in the Nelliampathy Hills. Unfortunately he does not say to what elevation. At Nemmāra (300 ft.) along the northern base of these hills, however, the Survey noted it as common. It was usually seen in pairs and frequently as a member of the mixed hunting parties.

Fairbank (*S.F.*, v, 396) describes it as abundant in the heavy forest in the Lower Palnis. It would be interesting to know if his identification was confirmed by specimens. In Ceylon it is replaced by the race *B. b. intermedius.*

Breeding: Specimen No. 72 (12 January) had a distinctly granular ovary and No. 475 (20 March) though with testes only 3×2 mm., had a prominent incubation patch and had probably lately finished breeding. The largest ovarian follicle of No. 720 (24 July) measured about 2 mm. in diameter, and both it and No. 794 (5 August—testes 8×4 mm.) were apparently breeding. No more definite information in this regard was obtained, however. According to the *Fauna* (iv, 69) Kinloch found a nest with two eggs in the Nelliampathy Hills in March.

Dinopium javanense malabaricum Whistler. The Malabar Golden-backed Three-toed Woodpecker.

Specimens collected: 126 ♀ 22-1-33 Sānthanpāra 3,500 ft.; 424 ♀ 9-3-33 Camp Derāmalāi 3,000 ft.; 646 o? imm., 647 o? 23-4-33 Balamore Estate (at 3,500 ft.—Ashāmbū Hills); 871 ♀ 16-11-33 Kūriārkūtti (1,600 ft.).

Elsewhere noted at: Thattākād (200 ft.); Tenmalāi (500 ft.); Pādagiri (3,000 ft.—Nelliampathy Hills).

Colours of bare parts: Iris reddish-brown to brownish-red; bill slaty-brown, grey at chin, gape and base of lower mandible; mouth greyish-pink; legs and feet greenish-grey to greyish-green; claws slaty-brown.

[Measurements:

	Bill.	Wing.	Tail.	Tarsus.
1 ♂	31	135	87	22 mm.
4 ♀♀	26.5-31.5	137.5-139	82.5-94	22-24 mm.

Additional specimens seen:

Brit. Mus. Coll.: ♂♀ no date, ♂ 25-7-78, ♀ -10-78, ♀11-7-78, ♀♀ 5-10-74, ♂ 27-11-74 Mynall (Bourdillon); ♂ 13-1-72 Assambo Hills (Hume Coll.).

Sparrow Coll.: ♀ 26-3-14 Cardamom Hills.—H. W.]

In Travancore and Cochin, this woodpecker—in my experience—is confined more or less to the humid evergreen forest tracts, both in the low foothills country and up to an elevation of at least 4,000 ft. Ferguson says (*J.B.N.H.S.*, xv, 655) 'very common in the hills at all elevations'. Bourdillon (*S.F.*, iv, 390) considered it as one of the commonest birds in hill forest and not occurring in the low country. In this biotope it is partial to cardamom sholas where the birds move about usually in pairs on the trunks and boughs of the lofty shade trees. In localities where evergreen sholas and mixed deciduous bamboo jungle alternated, this woodpecker was noticeably more common in the former than in the latter.

It has not been recorded from the Palni Hills and it does not occur in Ceylon.

Breeding: The ovary of No. 126 (22 January) suggested that it was preparing to breed shortly. The largest follicles measured over 2 mm. in diameter. No. 646 (23 April) was definitely immature with a poorly ossified skull, and it was undergoing post-juvenal moult. This data, meagre as it is, supports the finding of Stewart and Bourdillon (*Nidification*, iii, 308) that the breeding season in Travancore is from February to April. T. F. Bourdillon found it breeding in the Ashāmbu Hills (at 3,000 ft.) in March, whilst both he and Stewart took eggs from early February to mid-April and rarely into May. A normal clutch is said to be of two or three eggs (*Fauna*, iv, 74).

Chrysocolaptes festivus Boddaert. The Black-backed Woodpecker.

Specimens not obtained. I have only a single unconfirmed sight-record of this woodpecker from Thattākād (200 ft. elevation—4-2-33) and it is evidently rare in this area. Ferguson has not included it in his Travancore list, neither has it been recorded from the Palni Hills.

Breeding: According to the *Fauna* (iv 77) Stewart obtained an egg in Travancore on 4 February from a hole in a tree in deciduous forest. I do not know if the specimen of the bird was also collected at the time, and if not, how far this record is to be relied upon.

Chrysocolaptes guttacristatus chersonesus Kloss. Malherbe's Golden-backed Woodpecker.

Specimens collected: 111 ♀ 18-1-33 Mūnnār ca. 5,000 ft.; 863 ♂ 14-11-33 Kūriārkūtti 1,600 ft.; 970 ♀ 12-12-33 Pādagiri 3,000 ft.

Elsewhere noted at: Ūrūmbikera Forest (ca. 1,000 ft.—near Mūndakāyam); Peermade (3,200 ft.); Tenmalāi (500 ft.).

Colours of bare parts: Iris cream colour with a pinkish tinge. More precisely, a fine outer ring reddish, inner pinkish cream colour; bill dark horny-brown, plumbeous at chin; mouth pale slaty pink; legs and feet greyish-green or greenish-plumbeous; claws dark horny.

[Measurements:

	Bill.	Wing.	Tail.	Tarsus.
1 ♂	48	153	—	30.5 mm.
2 ♀♀	43.5-49.5	147-157	89	27 mm.

Other specimens examined:

Brit. Mus. Coll.: ♀ 18-6-77 Periur, Lower Palnis (Fairbank); ♀ Mynall (Bourdillon); ♀ Trivandrum (Fry); ♀ 22-2-14 Anaichardi Estate (Stewart).

The young male and the young female have the colour of the heads as in their respective sexes, and they otherwise agree with the adults except that the markings of the breast are not quite so definitly squamated.—H. W.]

This woodpecker is also fairly common in and about evergreen forest tracts. It inhabits the foothills country as well as the hills up to at least 5,000 ft. elevation. Ferguson (*J.B.N.H.S.*, xv, 655) shot it at 6,000 ft. on the High Range. It was not met with in the plains or coastal belt, either in Travancore or Cochin. It is fond of the scrub and secondary mixed jungle on the fringe of evergreen, i.e. the transition zone between the latter and the adjacent deciduous forest. It runs about on the trunks and branches of the saplings and trees, both large and small, in search of insects. The call is similar to but somewhat less harsh than that of *Brachypternus*.

In the Nelliampathy Hills, Kinloch (*J.B.N.H.S.*, xxviii, 546) discovered a woodpecker, probably this species, roosting at night on a bare branch of an *Albizzia stipulata* tree at an angle of 45 degrees from the trunk. The bird was squatting along it as if in search of food.

Fairbank (*S.F.*, v, 396) states that this species ranges in the Palnis from the base to the summit, and that it is probably the commonest woodpecker in those hills. In Ceylon it is replaced by the race *C. g. stricklandi*.

Breeding: Specimen No. 970 (12 December) had a mature ovary with some of the follicles measuring 2-2.5 mm. in diameter. Its oviduct, moreover, was distended and a prominent incubation patch was present on the abdomen. This bird was evidently breeding. The gonads of the other two specimens were in a quiescent state.

Nothing seems to be recorded about its breeding within our area proper, but according to the *Fauna* (iv, 81) in the Nilgiri and other hills of South India, this race breeds during December, January and February, and occasionally March. Betts (*J.B.N.H.S.*, xxxvii, 200) has also found eggs by the middle of December in Coorg, at between 3,000 and 5,000 ft. elevation.

Hemicircus canente cordatus Jerdon. The Malabar Heart-spotted Woodpecker.

Specimens collected: 203 ♀ 3-2-33, 211 ♀ 4-2-33 Thattākād 200 ft.; 469 ♂ 19-3-33 Rājampāra 1,350 ft.; 487 ♀ 24-3-33 Tenmalāi 500 ft.; 674 ♀ 27-4-33 Balamore Estate 2,000 ft.—Ashāmbu Hills.

Elsewhere noted at: Kūmili and Periyār Lake Environs (3,000 ft.); Kūriārkūtti (1,600 ft.); Pādagiri (3,000 ft.).

Colours of bare parts: Iris olive-brown; bill dark horny brown; mouth greyish-pink; legs, feet and claws blackish-slate in two specimens, brownish-black in three.

[Measurements:

	Bill.	Wing.	Tail.	Tarsus.
2 ♂♂	20.5-22	94-94.5	34-35	17.5-18 mm.
4 ♀♀	17-18.5	84.5-91	30-32	16-18.5 mm.

Additional specimens seen:

Brit. Mus. Coll.: ♂♀ 3-12-74, ♀ 13-12-78, ♀ 15-12-79 Mynall (Bourdillon).

B.N.H.S. Coll.: [♂] 14-10-94 Mudumallai Forest (J. P. Cook); [♀] 23-8-93 Perriar, Travancore (J. P. Cook).

I find considerable difficulty in understanding the plumages of this woodpecker, but this may be due to wrong sexing of many specimens in collections.

Of the allied *H. c. canente* Hume wrote (*S.F.*, iii, 62) that the adult male has the top of the head black with minute white spotting on all but the long crest feathers. The adult female and the young male, on the other hand—and presumably also therefore the young female—have the forehead and crown white or buffy white with the nape and crest black. I have somewhat expanded Hume's actual words. The young bird has the whole lower plumage —except of course the pale throat-patch—black, while the adult has the lower plumage either black washed with dull olive or entirely dull olive. Mr. Sálim Ali's series, so far as it goes, supports this theory of the plumages and No. 487 shows the moult from black to olive on the breast.—H. W.]

The Heart-spotted Woodpecker is not uncommon in the evergreen forest tracts of the two States, in the foothills country as well as up to an elevation of at least 3,500 ft. The Surveys usually found it in pairs affecting dense deciduous forest on the edge of evergreen jungle, or more precisely, the transition zone between the two habitat types, sometimes among bamboo clumps. I never heard it 'drumming' on a stem or branch, but merely tapping gently on the bark four or five times in succession in order to dislodge insects from the crevices.

Davison (*S.F.*, vi, 127) has drawn attention to the bristly tufts of feathers borne on the middle of the lower back by both sexes, which are clotted by a gummy substance that emits a strong resinous odour. The use of this tuft and the nature of the glands producing the viscid matter is unknown. A specimen preserved in alcohol has been forwarded to Dr. Stresemann of Berlin for histological investigation of the skin of this region, and his report is awaited. The tongue mechanism of this woodpecker has been recently studied in detail and comparatively by Joachim Steinbacher (*J.f.O.*, July 1934). It is interesting to note that the genus *Hemicircus* differs from all other woodpeckers (except the North American *Dryobates villosus*) in that the hyoid horns are curled round the right bulbus oculi, approximating to the condition described by Stresemann in his *Aves* (p. 453, fig. 463).

This woodpecker has not been recorded from the Palni Hills and it is not known to occur in Ceylon.

Breeding: The gonads of the specimens were undeveloped and no indication as regards breeding was provided by them. In Travancore, C. Primrose (*J.B.N.H.S.*, xxxv, 207) took eggs from holes excavated by the birds in fencing posts round a plantation—3 ft. from the ground—on 26 November and 15 December. Usually, however, it is said to make a tunnel in a dead branch of a tree standing in forest, at considerable heights. Stewart(*Nidification*, iii, 313) took two clutches of three eggs each on 8 January and 3 May. It would appear, therefore, that the breeding season in Travancore is a prolonged one.

Macropicus javensis hodgsonii (Jerdon). The Malabar Great Black Woodpecker.

Specimen collected: 123 ♂ 22-1-33 Sānthanpāra 3,500 ft.

Elsewhere noted at: Thattākād (200 ft.); Camp Derāmalāi (3,000 ft.—Panthalam Hills); Kūriārkūtti (1,600 ft.—Annemalāi Hills); Pādagiri (3,000 ft. —Nelliampathy Hills).

Colours of bare parts: Iris yellowish cream colour; bill horny-slate, paler on sides of lower mandible; legs and feet greyish-slate; claws horny-brown.

[Measurements:

	Bill.	Wing.	Tail.	Tarsus.
2 ♂♂	64.5	217.5-222	163-166.5	36 mm.

Additional specimens seen:

Brit. Mus. Coll.: ♂ no date Mynall (Hume Coll.); ♀ 26-11-79, ♀ 8-12-74 Mynall, 3,000 ft. (Bourdillon).—H. W.]

This magnificent woodpecker is confined to the evergreen forest biotope in Travancore and Cochin. The Surveys came across it from the foothills country as at Thattākād up to an elevation of at least 3,500 ft. It was not uncommon locally and in patches, but nowhere numerically abundant. Cardamom sholas and well-shaded tea and coffee plantations constitute favourite haunts, and like several of the forest-loving woodpeckers described previously, it is most partial to the densely wooded intermediate zone on the edge of evergreen sholas with a free intermingling of the evergreen and deciduous types of vegetation, often including bamboo. The birds were met with in pairs and occasionally singly, but as they were manifestly breeding at this time these latter may have been individuals whose mates were on eggs.

The loud metallic call of a single note—*clang*—is repeated every two seconds or so while the bird scuttles in short spurts up and around the trunk of a lofty tree, or during flight from one patch of forest to another. This sound carries a great distance. The stomach of the specimen contained a fat, juicy larva of some wood-boring beetle about 1½ in. (40 mm.) long.

Neither Fairbank nor Terry have included this species in their Palnis lists, though it doubtless occurs there in suitable facies. From an ecological point of view it seems rather curious that this woodpecker does not occur in Ceylon.

Breeding: The testes of the specimen (22 January) measured 16×7 mm. and it was undoubtedly breeding. According to Kinloch (*J.B.N.H.S.*, xxix, 561) eggs—normally c/2, not 1—are laid in the Nelliampathies in January. The nest-hole is usually excavated at heights of 35-50 ft. from the ground. The entrance is about 6 in. in diameter, the hollow itself being 2-2½ ft. deep. During excavation by the birds the ground for some yards round the base of the tree becomes littered with fragments of wood. On 7 March, Kinloch found two naked chicks in a hole 20 ft. up in a *Grevillea robusta* tree (*J.B.N.H.S.*, xxvii, 942).

Vivia innominatus avunculorum (Hartert). The Nilgiri Speckled Piculet.

Not met with by the Surveys. Ferguson (*J.B.N.H.S.*, xv, 656) only shot a single specimen of this little woodpecker in dense forest on the hills in South Travancore at ca. 4,000 ft., and saw another on the same day. Both were on living trees. I have seen a single fragmentary skin in the Trivandrum Museum labelled 'Chemunji, April 1893 (or 1898?)' which is probably the one referred to above.

According to the *Fauna* (iv, 94) Stewart and Bourdillon both obtained it in the Travancore hills. It has not been recorded from the Palni Hills and it does not occur in Ceylon.

FAMILY: CAPITONIDÆ.

Thereiceryx zeylanicus zeylanicus (Gmel.). The Ceylon Green Barbet.

Specimens collected: 599 ♂ 15-4-33 Arāmboli 250 ft.

I have seen a specimen in the Trivandrum Museum from Vembayam ca. 12 miles North-East of Trivandrum town.

Elsewhere noted at: Thattākād (200 ft.); Karūpadanna (ca. S.L.—unconfirmed and doubtful).

Colours of bare parts: 'Bill reddish, darker at tip; patch round eye yellow; legs yellow; claws horny' (Humayun and Pillai).

[The single specimen agrees definitely with the typical race from Ceylon as do a series of nine 'Anjango' specimens in the British Museum. In the *New Fauna* (iv, 109-111) the typical race is said to be confined to the southern quarter of Travancore, and this is again emphasised in *Nidification* (iii, 326), while *T. z. inornatus* is said to occur in the rest of the country. I can find no evidence in support of this division of races in Travancore. Besides the above 'Anjango' specimens I have seen only two other specimens from Travancore, a female of the typical race obtained at Kuravenuth (?) by J. P. Cook on 29-8-93 (Society's Collection) and a specimen in the British Museum collected by Surgeon-General Fry at Trivandrum and labelled *inornatus*. The latter is, in my opinion, a worn specimen of the typical race and Trivandrum is of course right in the south of the country.—H. W.]

The Ceylon Green Barbet is, on the whole, not a common bird in Travancore and Cochin. The Surveys only came across it in the low country where it was fairly abundant though locally and patchily distributed. Ferguson (*J.B.N.H.S.*, xv, 656) once shot a specimen in the hills at 4,000 ft. elevation, but this was doubtless exceptional. Its voice and call—*Krrr, kr-r-r, kutroo, kutroo*, etc.—is slightly different from that of the much commoner and almost ubiquitous Small Green Barbet, but still sufficiently like it to confuse the bearer. At Thattākād I commonly observed this Barbet feeding on the nectar of *Bombax malabaricum* flowers in the usual mixed avian company.

It has not been recorded from the Palni Hills. It is found in Ceylon in the low country and up to about 4,000 ft. elevation.

Breeding: The specimen (15 April) had testes enlarged to 10×5 mm. It was in fresh plumage and evidently breeding. *Nidification* (iii, 326) records that Stewart took two nests, each containing c/3 in the extreme south of Travancore on 7 March.

Thereiceryx viridis Boddaert. The Small Green Barbet.

Specimens collected: 7 ♀ 4-1-33 Marāiyūr 3,500 ft.; 233 ♀ 7-2-33 Thattākād 200 ft.; 685 ♂ 18-7-33 (Public Gardens); 744 ♂ 29-7-33 (Kūttāni, ca. 300 ft.); 833 ♀ 11-8-33 (Pūlayanārkotta ca. 200 ft.) Trivandrum Town and Environs; 872 ♂ 16-11-33 Kūriārkūtti 1,600 ft.; 1035 ♀ 28-12-33 Karūpadanna ca. S.L.

Elsewhere noted at: Sānthanpāra (3,500 ft.); Kottāyam (ca. S.L.); Peermade 3,200 ft.); Kūmili and Periyār Lake Environs (3,000 ft.); Camp Derāmalāi (3,000 ft.); Rājampāra (1,350 ft.); Tenmalāi (500 ft.); Balamore Estate (2,000 ft.); Chālakūdi; Wadakkāncheri (400 ft.); Nemmāra (300 ft.); Pādagiri (3,000 ft.).

Colours of bare parts: Iris chestnut-brown or dark brown; eyelids or circumorbital rim slaty-black; bill brownish flesh-colour, browner on culmen, plumbeous at gape; mouth pinkish-grey; legs and feet greenish-grey; claws horny-brown.

[Additional specimens examined:

Brit. Mus. Coll.: A series from the Palnis (Fairbank); a series from Mynall (Bourdillon); ♀ -3-72 Glengarnock (Bourdillon); ♂ 21-2-70 Cardamom Hills (W. Davison).

B.N.H.S. Coll.: ♀ 9-6-93, ♂ 22-6-93 Palnis.

H. Whistler Coll.: o? 12-5-23 Nelliampathies 3,600 ft. (Kinloch).

There is a complete post-nuptial moult, starting about May and June, but no spring moult. Worn birds are paler in colour especially on the crown and breast, the latter becoming much whiter with the wearing off of the brown margins to the feathers.

The juvenile plumage is similar to that of the adult except that the streaking of the head, neck and breast is not so well-defined and the head is rather paler.—H. W.]

The Small Green Barbet is a very common species throughout Travancore and Cochin, being found in the low country as well as up to at least 4,000 ft. in the hills. It frequents all types of forest and also gardens and groves in the neighbourhood of towns, villages and cultivation, and its monotonous call of *kutroo-kutroo* etc. may be heard on all sides. In March it was noted as particularly obstreperous, calling unceasingly all day long, and sometimes also during moonlit nights. As soon as one bird begins to call he is almost invariably joined in by another from some distance, and this uneven duet is kept up for a considerable time. The birds keep singly or in pairs, but are most often met gregariously—frequently twenty or more—on some *Ficus* or other tree in fruit where they foregather in company with numerous other frugivorous species. Their food consists to a very large extent of Banyan or Peepal figs and those of the various other species of *Ficus*. *Lantana* berries are likewise eaten, and I have even observed one devouring a green grasshopper. In coffee plantations they do considerable damage to the ripening 'cherries', the epicarp of which they greatly relish. Nectar of *Erythrina lithosperma* and *Grevillea robusta* is also regularly sought after, and from the pollen adhering to the forehead and throat feathers of specimens shot off these flowers, it is evident that they assist in cross-pollination.

Fairbank (*S.F.*, v, 396) writes that in the Palni Hills this barbet is found abundantly in groves and trees at all elevations. It does not occur in Ceylon.

Breeding: Specimen No. 1035 (28 December) was undoubtedly breeding. Its largest ovarian follicle measured 4 mm. in diameter. In No. 7 (4 January) the follicles were about 1 mm. in diameter and appeared to be enlarging. On 31 January a bird was observed clinging outside a nest-hole in a dead branch of a tree standing on the edge of forest. The gonads of the July-August specimens were in a quiescent state, and the birds were undergoing post-nuptial moult. According to Kinloch (*Nidification,* iii, 331) it breeds in the Nelliampathy Hills in February. F. W. Bourdillon obtained two unfledged chicks from a nest in the South Travancore hills early in April (*S.F.*, iv, 391).

Xantholœma hæmacephala indica (Latham). The Crimson-breasted Barbet.

Specimens collected: 52 ♀ 10-1-33 Marāiyūr 3,500 ft.; 684 ♀ 17-7-33 (Beach); 758 ♂ 31-7-33 (Akkūlam ca. 150 ft.); 763 ♀ 1-8-33 (Public Gardens) Trivandrum Town and Environs.

Elsewhere noted at: Kottāyam (ca. S.L.); Cape Comorin; Arāmboli (250 ft.); Kūriārkūtti (1,600 ft.); Wadakkāncheri (400 ft.); Trichūr.

Colours of bare parts: Iris dark brown ('greyish-brown'—Pillai); eyelids coral-red; bill horny black, cream coloured at chin; mouth greyish-pink; legs and feet dull coral-red; claws black.

[Measurements:

	Bill.	Wing.	Tail.
1 ♂	18	79	33 mm.
3 ♀♀	18.5-19	77-80.5	31.5-33.5 mm.

The only other Travancore specimens seen are four unsexed birds with no precise data.

A complete post-nuptial moult, beginning about July. No spring moult. The juvenile is similar to the adult but the green is rather greyish in tint. The forehead, crown and nape are uniform with the rest of the upper parts, i.e. they lack the red, black and grey of the adult. The yellow above and below the eye is paler, the black behind the eye and ear-coverts and on the moustachial streak is duller and less in extent; the chin and throat are greyish-white, tinged with yellow round the chin and sides; breast greyish-green, merging into the streaking of the lower breast and flanks. The post-juvenal moult is presumably complete as the first-year bird is in no way distinguishable from the adult.—H. W.]

With the exception of Marāiyūr, where it was common, the Coppersmith was only met with by the Surveys in the low country below 500 ft. Ferguson (*J.B.N.H.S.*, xv, 657) says that at times it may be found in the hills up to 1,500 ft. elevation. It frequents lightly wooded terrain about cultivation, groves of trees near villages and human habitations, also the gardens and compounds of the larger towns. Its diet consists principally of Peepal and Banyan figs, and large numbers of birds collect on the trees laden with these fruits.

In the Palni Hills, according to Fairbank (*S.F.*, v, 397), it is common at the base and up to 4,000 ft. I do not know if Fairbank obtained specimens, but if not I suspect he may have confused it with *malabarica.* Confirmation is desirable. It occurs in the drier areas of Ceylon.

Breeding: The ovary of No. 684 (17 July) has been drawn by Mr. Pillai as distinctly granular with some of the follicles measuring over 1 mm. in diameter. The specimen, however, was undergoing post-nuptial moult and so had apparently lately finished breeding. According to Ferguson, T. F. Bourdillon obtained eggs near Courtallum (at ca. 1,500 ft.) in March, but I am not sure if this same record is not referred by F. W. Bourdillon (*S.F.*, iv, 392) to the Crimson-throated species!

On 8 April (Cape Comorin) Humayun Abdulali found a nest excavated in a vertical Drumstick (*Moringa oleifera*) branch at a height of 15 ft. It contained c/2 slightly set. The eggs measured 24×18 mm. and 23×16 mm. respectively. They were laid in the hollow about 6 in. deep, on chips of wood which had apparently fallen in during excavation. Humayun noted that the chips were wet (in spite of the dry weather) as was also the abdomen of the sitting bird.

Xantholœma rubricapilla malabarica (Blyth). The Crimson-throated Barbet.

Specimens collected: 199 ♀ 24-1-33 Sānthanpāra 3,500 ft.; 502 ♀ 27-3-33 Tenmalāi 500 ft.

Elsewhere noted at: Thattākād (200 ft.); Kūmili (3,000 ft.); Balamore Estate (2,000 ft.—Ashāmbu Hills); Pādagiri (3,000 ft.—Nelliampathy Hills).

Colours of bare parts: Iris brown; bill upper mandible horny-brown, lower pale flesh colour at chin, plumbeous at gape and sides except near terminal portion, which brownish; mouth greyish-pink; legs and feet coral pink; claws horny-brown.

[Other specimens seen from Travancore:
Sparrow Coll.: o? 14-5-14 Cardamom Hills.
Brit. Mus. Coll.: ♀ 21-2-70 Cardamom Hills 4,000 ft. (Also four birds with no proper data).

Measurements:

	Bill.	Wing.	Tail.
3 ♀♀	17-18	80-87.5	35-39 mm.

For a note on the juvenile plumage and my reason for considering this a race of the Ceylon bird, see Eastern Ghats Survey Report (*J.B.N.H.S.*, xxxvii, 517).—H. W.]

I agree with Ferguson (*J.B.N.H.S.*, xv, 657) that Bourdillon's description of the status of this barbet in Travancore is entirely misleading. I would go further and say that in my experience both in Travancore and in Cochin, the Crimson-throated Barbet more or less completely replaces the Crimson-breasted species in evergreen biotope, both in the foothills and higher up—to 4,000 ft. at least. A scrutiny of the localities where the two species were met with by the Surveys will show this clearly. It is common in suitable localities, and like its low country congener, resorts to feed gregariously on the various Fici in company with Green Pigeons, Hornbills and numerous other frugivorous birds.

I found its voice and call indistinguishable from the foregoing species.

Fairbank's Palni list (*S.F.*, v) omits this species altogether. I suggest what has probably happened is that in giving the range of *haemacephala* as 'Common at base and up to 4,000 ft.' he has muddled up the two species, the one being found presumably in the drier country about the base and the other in evergreen biotope higher up. Confirmation is desirable.

The typical race *X. r. rubricapilla* replaces it in Ceylon where it is said to be a bird of the low country, extending up to 2,500 ft.

Breeding: Both the specimens (24 January and 27 March) had conspicuously granular ovaries, and in the latter a prominent incubation patch was present besides. On 5 March (Kūmili) an individual was observed emerging from a nest-hole in the stump of a vertical *Erythrina* branch, about 20 ft. up, and it was evidently breeding.

The record of eggs obtained by Bourdillon early in March (*Nidification*, iii, 340) is doubtful as Mr. Whistler has shown (*J.B.N.H.S.*, xxxvii, 517).

(*To be continued*).

THE MEDICINAL AND POISONOUS ORCHIDS OF INDIA.

BY

J. F. Caius, S.J., F.L.S.

The Orchidaceae include about 610 genera with over 8,000 species, mostly natives of tropical and subtropical countries, less frequent in temperate countries, a few being found in cold mountainous regions.

The medicinal and poisonous Orchids of the world belong to 38 distinct genera:—Acampe (Indo-Malaya, Africa); Aceras (Mediterranean); Anacamptis (Europe, North Africa); Angraecum (La Reunion, Mauritius); Ansellia (Tropical Africa); Aplostellis (Old World tropics and subtropics); Bletia (Tropical America); Corallorhiza (North America); Cremastra (Japan); Cymbidium (Tropical Asia, Africa, Australia); Cypripedium (Northern cold and temperate regions, Mexico); Cyrtopodium (America); Dendrobium (Tropical Asia to Japan, Australia, Polynesia); Desmotrichum (Indo-China, Malay Islands); Epidendrum (Tropical America); Eulophia (Africa, Indo-Malaya); Galeandra (Tropical America); Gastrodia (Indo-Malaya, Japan, China, Australia); Goodyera (Europe, Asia, Mascarene Islands, North America); Govenia (Tropical America); Gymnadenia (Europe, Asia); Habenaria (whole world); Hetaeria (Africa, Indo-Malaya, Polynesia); Limodorum (Mediterranean); Lissochilus (Africa); Luisia (Indo-Malaya, Polynesia); Microstylis (cosmopolitan; chiefly tropical); Monadenium (Africa); Neottia (Temperate Europe, Temperate Asia); Oberonia (Old World Tropics, Japan); Ophrys (Europe, Mediterranean); Orchis (Mediterranean, Temperate Europe, Asia, North America, North Africa); Platanthera (North America, Tropical Asia, Africa); Rhynchostylis (Indo-Malaya); Saccolabium (Africa, Indo-Malaya, China); Vanda (Asia, Australasia); Vanilla (All tropical countries); Zeuxine (Tropical Asia, Africa).

The medicinal and poisonous Orchids of India belong to 15 distinct genera:—Acampe, Cymbidium, Dendrobium, Desmotrichum, Eulophia, Habenaria, Hetaeria, Luisia, Oberonia, Orchis, Rhynchostylis, Saccolabium, Vanda, Vanilla, Zeuxine.

A. Anther 1, opercular. Pollinia waxy, 1-4 in each cell:
  1. Column footless. Lip entire or lobed, with a nectar depression at base ... ... Oberonia.
  2. Column with a long foot. Lip adnate to the produced foot of the column, contracted at the base or clawed:
    a. Flowers fascicled ... ... Desmotrichum.
    b. Flowers solitary or in fascicles or racemes ... Dendrobium.

B. Anther 1, posticous. Pollinia waxy, usually 2 or 4:
  1. Scape usually leafless. Petals like the dorsal sepal; lip gibbous or saccate, rarely spurred ... Eulophia.
  2. Sepals and petals subequal, spreading; lobes of the lip embracing the unwinged column. Leafy stems short, pseudobulbous ... ... Cymbidium.

3. Sepals and petals fleshy, widely spreading from a narrow base. Flowers large, in simple racemes. Vanda.
4. Sepals and petals subequal. Columns short stout, no foot. Flowers small pink or white crowded in dense racemes showy; lip entire ... ... Rhynchostylis.
5. Sepals and petals widely spreading. Column without appendages. Flowers small, in simple or branched racemes; lip 3-lobed with callus in the spur mouth ... ... Saccolabium.
6. Sepals and petals thick, concave. Flowers small, crowded in a short rigid, simple or branched peduncle; lip obscurely 3-lobed, no callus ... Acampe.
7. Sepals subequal or the depressed dorsal smaller. Petals narrower often longer, spreading. Column much shorter than the lip, truncate. Flowers few in short lateral spikes. Lip sessile on column base, divided into basal and apical parts ... Luisia.

C. Stem not bulbous. Anther 1, posticous, opercular or erect and persistent. Pollen granular, powdery or in small masses:
1. Sepals and petals subequal, spreading. Column long, anther broad ... ... Vanilla.
2. Sepals free, dorsal with the petals cohering in a hood; lip with dilated end. Column very short with lamellar or conic processes in front ... Zeuxine.
3. Upper sepal usually adnate to petals pubescent; lip without a dilated end. Column rather large with long rostellar arms ... ... Hetaeria.

D. Anther 1, posticous, erect, inclined or reflexed. Pollinia 1 rarely 2 in each cell, granular, produced into short caudicles. Terrestrial herbs:
1. Lip spurred. Glands of the pollinia both in one pouch Orchis.
2. Lip spurred, sepals equalling or exceeding the petals. Flowers spicate or racemose; rostellum not elongate ... ... Habenaria.

It is chiefly as sources of Salep that orchids have become therapeutically famous, and it is as sources of salep that some species are still retained in the pharmacopoeias of Austria, Belgium, Germany, Holland, Japan, Norway, Portugal, Russia and Switzerland.

Salep is the name given to the tubers or tuberous roots of various orchids, collected in the flowering season, immersed in boiling water for a short time, and dried. At present the salep of European commerce is prepared chiefly in the Levant, but to some extent in Germany and other parts of Europe. The tubers are collected from wild plants growing in Asia Minor, South-west Asia, France and Germany. The salep of the Indian bazars is produced in the hills of Afghanistan, Baluchistan, Persia and Bokhara; a part of it is obtained from the Nilgiri Hills and also from Ceylon.

From ancient times salep has been considered to possess great invigorating virtues, and has hence been extensively prescribed both in Europe and the east for recruiting the exhausted vitality of aged and enervated persons. An infusion or decoction was taken generally in England as a beverage before the introduction of tea and coffee. Sassafras chips were sometimes added for giving the drink a flavour.

Though its medieval and oriental reputation as an aphrodisiac has been irretrievably lost in the West, salep is still considered highly nutritive and a most useful article of diet for those who suffer from chronic diarrhoea. All scientific opinion, however, concurs in the belief that salep is devoid of medicinal virtue and that it is highly doubtful if its nourishing properties are as great as they are supposed to be.

In the east, nevertheless, faith in the efficacy of the drug is still unshaken and the dry tuber has an immense reputation as an aphrodisiac, a nervine restorative, and a fattener. It is much used by *vaids* and *hakims* in conjunction with other nervine tonics. It is also considered a very nourishing article of diet, and is given mixed with milk and flavoured with spices and sugar. In fact salep is so very highly esteemed and is in such great demand that 'imitation salep' is largely prepared for the Indian trade. Wealthy Orientals are known to have paid a handsome price for pounded potatoes and gum. 'Royal Salep', said to be much used as a food in Afghanistan, has been identified as the product of a liliaceous plant, *Allium macleanii* Baker.

The Order is remarkable for the absence of poisonous properties; only in so far, however, as trifles may be neglected, for three species are considered toxic. The natives of Portuguese East Africa say that a liquid extract of *Monadenium lugardae* N. E. Br. is poisonous and produces vomiting; the leaves and stem of the Malayan *Vanilla griffithii* Reich. f. contain an irritating latex; reports of violent dermatitis in workmen handling vanilla beans, *Vanilla planifolia* Andrews, are not uncommon.

It is no less interesting to note that four orchids are used in the treatment of various forms of insanity. Natives in the Mpika district of Northern Rhodesia administer an infusion of the leaves and stems of *Ansellia humilis* Bull. as a remedy for madness; American Indians give a decoction of the Swamp Orchid, *Simodorum giganteum* Thunb., to combat manias; on the Malabar Coast the powdered flowers of *Vanda spathulata* Spreng. are said to abate frenzy; and in France the fruit of *Vanilla planifolia* Andrews is prescribed in order to overcome melancholia.

ACAMPE.

This genus contains 12 species, mostly Indo-Malayan and Chinese, a few African.

Acampe wightiana Lindl. (=*Saccolabium praemorsum* Hook. f. =*S. Wightianum* Hook. f.) is found throughout Bengal, the Western Peninsula, and Ceylon.

The plant is a bitter tonic. It is used in rheumatism.

Canarese: Marabale—; *Malayalam*: Taliyamaravala—; *Marathi*: Kanbher—.

CYMBIDIUM.

The 30 species which constitute this genus inhabit Africa, Asia, Australia, extending as far as Japan.

Cymbidium aloifolium Swartz occurs in Nepal, the Terai, tropical Himalaya, eastwards to Sikkim, Western and Southern India, Ceylon.

The plant is said to be emetic and purgative.

English: Boat Orchid—.

DENDROBIUM.

Epiphytic herbs belonging to about 750 species and distributed throughout Tropical Asia, Japan, Australia and Polynesia.

D. ceraia Lindl., *D. moniliforme* Swartz, *D. nobile* Lindl. are used medicinally in China; *D. reptans* Franch. and Sav. is similarly used in Japan.

Two Indian species are credited with therapeutic properties:

1.	Stems tufted, 12-18 in. long, usually slender. Flowers in lateral and terminal racemes 3-6 in. long	*D. ovatum.*
2.	Pseudobulbs tufted, cylindric or dilate upwards, 2 in. long. Flowers 1 or 2 from terminal tuft of bracts	*D. pumilum.*

1. **Dendrobium ovatum** (Willd.) Kranzl. (=*D. chlorops* Lindl.) is found on the Western Ghats and the Western Coast of the Madras Presidency.

The plant is an emollient. The juice of the fresh plant is given internally for all kinds of stomach ache; it excites the bile and acts as a laxative to the intestines.

Malabar: Maravar—; *Marathi*: Nagli—.

2. **Dendrobium pumilum** Roxb. is very common on orchard trees in the Malay Peninsula whence it extends to Burma and Borneo.

The Malays use it as a drug in dropsy.

Malay: Sakat kalumbai—.

DESMOTRICHUM.

The genus consists of about 30 Indo-Malayan species.

Desmotrichum fimbriatum Bl. (=*Dendrobium macraei* Lindl.) inhabits the Western Ghats of the Bombay and Madras Presidencies, Ceylon, Sikkim, the Khasia Hills, Burma, the Malay Peninsula, whence it spreads to Siam, Borneo and the Philippine Islands.

Sanskrit writers describe the plant as cold, mucilaginous, light, strengthening, and as a remedy for disorders of the bile, blood and phlegm. The whole plant is used in decoction along with other drugs supposed to have similar properties. The fruit is said to be an aphrodisiac.

The plant is prescribed by Sushruta, in combination with other drugs, for the treatment of snake-bite and scorpion-sting; but Mhaskar and Caius have proved experimentally that it is not an antidote to either snake-venom or scorpion-venom.

The plant is occasionally used alone as a stimulant and tonic. As a tonic it is given in debility due to seminal losses.

Bengal: Jibai, Jibanti—; *Gujerati*: Jivanti, Radarudi, Wajhanti—; *Hindi*: Jiban, Joivanti, Sag—; *Marathi*: Jivanti—; *Sanskrit*: Bhadra, Jiva, Jivabhadra, Jivada, Jivani, Jivaniya, Jivanti, Jivapatri, Jivapushpi, Jivavardhini, Jivavrisha, Jivdatri, Jivya, Kanjika, Kshudrajiva, Madhushvasa, Madhusrava, Mangalya, Mrigaratika, Payaswini, Pranada, Putrabhadra, Raktangi, Shakashreshtha, Shashashimbika, Shringati, Srava, Sukhankari, Supringala, Yashaskari, Yashasya—.

EULOPHIA.

This genus numbers 200 species distributed through the warm countries of the Old World; they are especially numerous in Africa and Indo-Malaya.

E. arenaria Bohn., *E. flaccida* Schltr., *E. hians* Spreng., *E. robusta* Rolfe are used medicinally in South Africa.

Among Eulophias which furnish salep to the Indian bazaars may be mentioned *E. campestris* Wall., *E. herbacea* Lindl., *E. nuda* Lindl. and *E. pratensis* Lindl.

A. Column produced into a foot. Flowers large; lateral sepals inserted on the spur of the lip ... ... *E. nuda.*

B. Column not produced into a foot:
1. Scape 7-12 in. long, sheathed at intervals by loose membranous bracts. Sepals linear-lanceolate. Petals narrower than the sepals, oblanceolate ... *E. campestris.*
2. Scape 1-3 ft. long with appressed acute sheaths. Sepals elliptic-oblong. Petals shorter and broader than the dorsal sepal, elliptic-oblong, obtuse. Lip broader than long ... ... *E. pratensis.*
3. Scape stout, 2-3 ft. high with large acuminate sheaths. Sepals linear-lanceolate. Petals oblong-elliptic, obtuse or subacute. Lip longer than broad ... ... *E. herbacea.*

1. **Eulophia campestris** Wall. is found in the sub-Himalayan tracts of Rohilkhand and North Oudh, Nepal, Sikkim, Chittagong, Bengal, Upper Burma, Baluchistan and Afghanistan.

Ayurvedists consider the tuber tonic, stomachic, aphrodisiac and alterative; they commonly give it to stimulate appetite and to purify the blood in heart troubles.

Yunani doctors credit the tuber with tonic, aphrodisiac and astringent properties; they consider it useful in stomatitis, purulent cough and paralytic conditions.

The plant furnishes a salep which is much prized by Indians as a tonic and aphrodisiac.

Arabic: Khusyu-uth-thalab—; *Bengal*: Salibmisri, Sungmisrie—; *Gujerati*: Salum—; *Hindi*: Salibmisri—; *Marathi*: Salamishri—; *Nepal*: Hattipaila—; *Persian*: Sungmisri—; *Punjab*: Salibmisri—; *Sanskrit*: Amrita, Amritodbhava, Jiva, Jivani, Pranabhrita, Pranada, Sudhamuli, Virakanda—; *Santal*: Bongataini—; *Urdu*: Salabmisri—.

2. **Eulophia herbacea** Lindl. is found in the Western Himalaya and Western Peninsula; it is met with in Kanara, Konkan and Gujerat.

The tuber furnishes an esteemed kind of salep.

3. **Eulophia nuda** Lindl. occurs in Tropical Himalaya from Nepal eastwards to Sikkim, in Chota Nagpur, Assam, the Khasia Hills, Manipur, Burma, the Western Peninsula and Ceylon.

Hindu practitioners use the tuber in tuberculous glands of the neck, tumours, bronchitis and diseases of the blood; they say it gives appetite and prescribe it accordingly.

The pounded fresh plant is applied to boils and abscesses to promote maturation and suppuration.

The powdered tuber is said to be an antidote for poisoning; it is administered internally to those suffering from intestinal worms.

The plant is a source of salep.

Bengal: Budbar—; *Hindi*: Ambarkand, Gourma—; *Marathi*: Ambarakand, Bhuikakali, Manakanda—; *Sanskrit*: Balakanda, Granthidala, Kandalata, Malakanda, Panktikanda, Trishikhadala—.

4. **Eulophia pratensis** Lindl. is apparently endemic in the Western Peninsula; it is found in the pasture-lands of the Deccan, in the Sholapur District and in Belgaum.

The tubers are applied externally and given internally to remove scrofulous glands in the neck. They are also administered internally as a worm remedy. They make up a large portion of the salep of Western India.

Marathi: Satavari—.

HABENARIA.

The genus contains about 500 species, widely diffused through tropical and subtropical regions.

An infusion of the root of *H. foliosa* Reichb. fil. is used as an emetic by the Zulus.

Habenaria commelinifolia Wall. occurs in the outer ranges of Western Himalaya from the Punjab to Kumaon up to 5,000 ft., extending eastwards to Parasnath, Chota Nagpur, Bihar and Upper Burma, Central India, Konkan, Western Ghats, Deccan, North Kanara and Bababudan Hills.

The plant is a source of salep.

Sadani: Jadu, Jaitjadu—.

HETAERIA.

The 40 species which make up this genus inhabit Africa, Indo-Malaya and Polynesia.

Hetaeria obliqua Bl. is common in the woods of the Malay Peninsula, extending thence to Sumatra and Borneo.

The plant is used by the Malays for poulticing sores.

Malay: Poko tumbak hutan—.

LUISIA.

The genus numbers about 15 species, mostly tropical Asiatic, a few Australian.

Luisia tenuifolia Bl. inhabits the Western Peninsula and Ceylon.

The pounded plant is used as an emollient. It is applied as a poultice to boils, abscesses and tumours.

OBERONIA.

The genus consists of about 60 species, tropical Asiatic, Australian and Pacific.

Oberonia anceps Lindl. is common throughout the Malay Peninsula; it extends to Tenasserim and Java.

The Malays use the leaves for poulticing.

Malay: Sakat lidah buaya—.

ORCHIS.

The 70 species of this genus are found in Europe, temperate Asia, North Africa and America.

The following are used in Europe for the preparation of salep:—*O. bifolia* Linn., *O. fusca* Linn., *O. hircina* Linn., *O. latifolia* Linn., *O. laxiflora* Lam., *O. maculata* Linn., *O. mascula* Linn., *O. militaris* Linn., *O. morio* Linn., *O. pyramidalis* Linn., *O. sambucina* Linn., *O. simia* Lam.

Orchis latifolia Linn. occurs in the Western Temperate Himalaya from Nepal to Kashmir, and Western Tibet at altitudes between 8,000 and 12,000 ft. It extends to Northern Asia and through Afghanistan to North Africa and the Atlantic. It usually grows in damp meadows and marshes.

The tubers are expectorant and astringent. They yield salep.

English: Marsh Orchid—; *Spanish*: Palma Christi—.

RHYNCHOSTYLIS.

The genus consists of 2 Indo-Malayan species.

Rhynchostylis retusa Bl. is distributed throughout India, Burma, the Malay Peninsula, Siam, Java, the Philippine Islands and Ceylon.

The fresh plant is used as an emollient.

SACCOLABIUM.

This genus comprises about 200 species, inhabitants of Africa, Indo-Malaya and China.

Saccolabium papillosum Lindl. is found in Bengal and the lower Himalaya Mountains from Sikkim eastwards, Assam, the Gangetic Delta and Tenasserim.

The root is considered a specific for rheumatism. It is commonly used as a substitute for sarsaparilla and for *Vanda tessellata*.

In the Konkan the roots are used as a cooling remedy.

Marathi: Nakuli, Rasna—; *Sanskrit*: Gandhata, Nakuli, Rasna—.

VANDA.

The genus consists of about 30 species found in Tropical Asia and Australia.

Two Indian species are credited with therapeutic properties.

1. Flowers 1.2 in. diam., golden yellow ... ... *V. spathulata*.
2. Flowers 1.5-2 in. diam., tessellated with brown ... *V. tessellata*.

1. **Vanda spathulata** Spreng. occurs in the Western Peninsula from Malabar to Travancore and Ceylon.

On the Malabar Coast the juice of the plant is supposed to temper the bile and abate frenzy. The golden yellow flowers, reduced to powder, are given in consumption, asthma and mania.

Malayalam: Ponnamponmaraiva—.

2. **Vanda tessellata** Hook. (=*V. Roxburghii* R. Br.) is found in Bengal, Chota Nagpur, Bihar, the Central Provinces, the Western Peninsula, Travancore and Ceylon.

Ayurvedists consider the root antipyretic and an antidote for poisoning; they use it in dyspepsia, bronchitis, inflammations, rheumatic pains, hiccough, tremors and diseases of the abdomen.

Yunani practitioners hold it to be laxative, and tonic to the liver and the brain; they prescribe it for bronchitis, piles, lumbago, toothache and boils on the scalp; they further say that it lessens inflammation and heals fractures.

Rasna root is commonly prescribed in a variety of forms for rheumatism and allied disorders. It enters into the composition of several medicated oils for external application in rheumatic pains and diseases of the nervous system.

In Chota Nagpur, the leaves pounded and made into a paste are applied to the body during fever, and the juice is introduced into the aural opening for inflammation of the middle ear.

The plant is occasionally given as a cure for snake-bite. Combined with other drugs it forms some of Charaka's and Sushruta's snake and scorpion remedies. Caius and Mhaskar have, however, shown experimentally that whether single or compounded it is not an antidote to either snake- or scorpion-venom.

Arabic: Kharkittan—; *Bengal*: Nai, Rasna—; *Bombay*: Rasna—; *Canarese*: Bandanike—; *Gujerati*: Rasno—; *Hindi*: Banda, Nai, Perasara, Persara, Rasna, Vanda—; *Marathi*: Rasna—; *Sanskrit*: Atirasa, Bhujangakshi, Chhatraki, Dronagandhika, Elaparni, Gandhanakuli, Muktarasa, Nakuleshta, Nakuli, Palankapa, Rasadhya, Rasana, Rasna, Rasya, Sarpagandha, Shreyasi, Sugandha, Sugandhimula, Surasa, Suvaha, Vandaka, Vriksharuha, Yuktarasa—; *Santal*: Darebanki—; *Telugu*: Chittiveduri, Kanapabadanika, Mardaru, Vadanika—; *Urdu*: Banda—.

VANILLA.

The genus consists of about 20 species; to be found in all tropical countries.

Vanilla planifolia Andrews and other species furnish the well-known vanilla pods of commerce, used as a flavouring ingredient and sometimes as a tonic,, carminative and aphrodisiac. The pod of *V. planifolia* is official in the pharmacopoeias of Austria, France, Japan, Portugal, Switzerland and Turkey.

Vanilla griffithii Reichb. fil. is common in the forests of the Malay Peninsula and the Karimun isles.

The leaves and stem, which contain an irritating latex, are mashed and applied to the hair for strengthening it.

The flowers pounded with water are rubbed on the body for fever.

Malay: Akar punubal, Telinah kerbau bukit—.

ZEUXINE.

This genus numbers about 20 species, tropical Asiatic and African.

Zeuxine strateumatica Schlechter (=*Z. sulcata* Lindl.) is found throughout the greater part of India up to 5,000 ft. on the outer Himalayan ranges; it also occurs in the Malay Peninsula and Ceylon, and is distributed to Afghanistan, China, Japan, Java and the Philippine Islands.

The tubers are used as salep.

Bengal: Shwethuli—.

BUTTERFLIES OF SECUNDERABAD.

BY

D. F. Sanders.

I have read with interest the article, by Lt.-Col. W. E. M. Logan Home, published in volume xxxvii, No. 4, of the Society's *Journal*, on the Butterflies occurring in the neighbourhood of Secunderabad.

I collected in the neighbourhood from the Spring of 1927 to June 1929 and, while I can confirm that all the species mentioned by Col. Logan Home were found by me to occur there, I would mention that the following were also taken by me in and around Hyderabad (Deccan).

I found the best places to be gardens, European and Indian, mango topes, and low scrub jungle; also grass lands and the surroundings of cultivated land, especially where, as often in the Deccan, small outcrops of granite boulders occur, surrounded by a fringe of prickly pear, which the wandering herds of goats are unable to penetrate and the butterflies' food-plants, which are elsewhere largely destroyed by them, are thus able to survive.

Another good place was the compound of the Imperial Bank of India at Hyderabad, which, in addition to a large garden, contained several acres of waste land with a plantation of toddy-palms; several species seemed to have made this land their habitat, owing to the fondness of the imagines for the toddy extracted from the trees, and by smearing the trunks of these trees with a mixture of toddy and gur, I was able to attract a fair number of species which were otherwise seldom seen.

My collecting was necessarily confined to this compound, except for occasional Sunday and holiday mornings, but I believe that I succeeded in securing all the species available in the District.

Additions to Col. Logan Home's List of the Butterflies of Secunderabad and the District.

A. Papilionidæ.

Chilasa clytia clytia *var.* **dissimilis.** Very rare.

Papilio crino. Very rare.

Pathysa nomius nomius. Very rare.

Zetides agamemnon menides. Common in February and March and again during the monsoon.

B. Pieridæ.

Leptosia nina nina. Not rare.

Delias hyparete ethire. This butterfly appears to get up *very* early in the morning and to spend its day flying around, or resting on, the tops of high trees. The few I caught were mostly taken in the evening, when the butterfly comes down to settle for the night. Rare. (This appears to be the first record of this insect occurring in the central parts of Southern India.)

Appias libythea libythea. Very rare.

,, **albina darada.** I only found two or three, in November 1928, in the Bank garden and saw no others elsewhere then or at any other time. Very rare.

Catopsilia florella gnoma. Very common.

Eurema laeta laeta. Very common, in all seasonal forms, especially on grass lands.

Colotis amata modesta. Not rare.

,, **eucharis.** Common.

Hebomoia glaucippe australis. I only saw two, flying fast and high, which I was unable to catch, but they were unmistakable. Very rare.

C. Danaidæ.

Danais aglea aglea. Very rare.

Euplœa coreta coreta. Rare.

,, **crassa kollari.** Very rare.

D. Satyridæ.

Mycalesis perseus typhlus. Not rare.

,, **visala visala.** Very rare.

Lethe rohria nilgiriensis. Rare. I caught a fair number at my toddy mixture otherwise seldom seen.

Orsotrioena medus medus. Very rare. This appears to be the first record of the occurrence of this insect from further south than the Central Provinces, from which Bingham records it.

Elymnias hypermnestra undularis. Very rare. Taken in the Bank garden in Spring. Bingham records this insect from Central India, though according to Evans it would not appear to occur south of Bengal.

F. Nymphalidæ.

Charaxes polyxena imna. Very rare. One male and one female only taken at my toddy mixture.

Euthalia garuda meridionalis. Very rare. Seen occasionally in gardens and mango topes, but the specimens I succeeded in catching were in such a bad condition that it was impossible to judge whether they were race ' meridionalis', or, as I believe, race ' anagama '.

Liminitis procris calidasa. Very rare.

Pantoporia perius. Very rare.

Neptis columella nilgirica. Rare ; only seen in February and March.

,, **hordonia hordonia.** Very rare.

Byblia ilithyia. Not rare, but very local. Occurs wherever its food plant is found, on the edges of cultivated land and on grass lands, in the Spring and again during the monsoon.

Ergolis merione merione. Very common, especially wherever Castor Seed crops are grown. Came to the toddy mixture.

G. Erycinidæ.

Abisara echerius suffusa. Very rare.

H. LYCAENIDÆ.

Talicada nyseus nyseus. Rare.

Tarucus ? . Common enough, but as, when I collected, I was unaware of the division of 'Theophrastus' into several distinct species, I cannot hazard an opinion as to which species occur.

Azanus ubaldus. Common.

,, **uranus.** Common.

,, **jesous gamra.** Rare and very local.

Everes parrhasius parrhasius. Very rare.

Lycænopsis puspa gisca. Very rare.

Chilades laius laius. Common.

Zizeeria maha ossa. Not rare.

,, **gaika.** Common.

Euchrysops cnejus. Common.

,, **pandava pandava.** Common.

Jamides alecto eurysaces. Very rare.

Loxura atymnus atymnus. Very rare.

Tajurla cippus cippus. Very rare. I never saw one flying, but a servant caught one in the Bank garden, and brought it to me fresh, but covered with finger-prints.

Virachola isocrates. Common ; the larvæ could always be found, in numbers, at suitable seasons of the year, in pomegranates.

The following, included in Col. Logan Home's list, were found at the toddy mixture spread on the toddy-palms:—

Lethe europa ragalva.

Melanitis leda ismene.

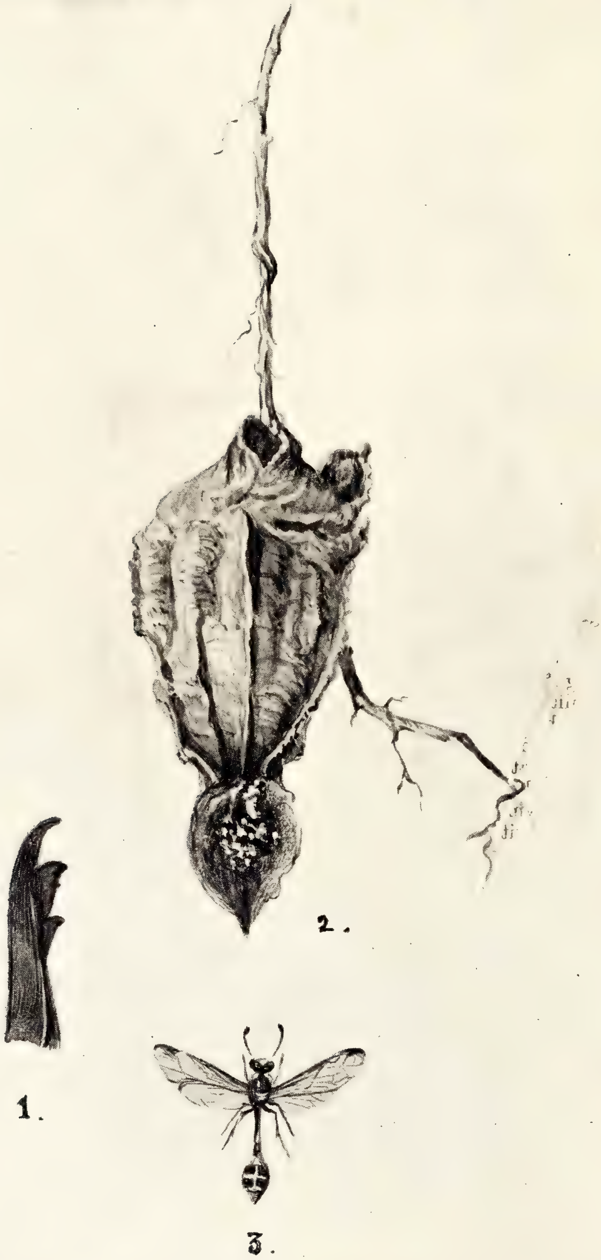
Charaxes fabius fabius. This insect appeared to be very rare but I succeeded in catching large quantities of both sexes on the toddy mixture ; they were most greedy and aggressive, fighting for favourable places, and were so occupied in their absorption that they could often be taken by hand.

Eriboea athamas agrarius. These were nothing like so common or greedy as 'fabius'.

Euthalia nais. These were obviously attracted by the good smell of the toddy mixture, but I never found them actually drinking ; instead, they used to sit about on the ground some distance from the trees treated with the mixture.

Neptis hylas varmona.

Ergolis ariadne indica.



Paravespa eva.
Fig. 1, mandible; fig. 2, nest; fig. 3, ♀ imago.

A DESCRIPTION OF A NEW SPECIES OF WASP ASSUMED TO BELONG TO THE FAMILY *VESPIDAE* AND NAMED *PARAVESPA EVA;* WITH REMARKS UPON ITS AFFINITIES WITH THE GENUS *ISCHNOGASTER* AND REASONS FOR THE CREATION OF THE NEW GENUS *PARAVESPA*.

BY

T. R. BELL, C.I.E., I.F.S. (*retired*).

(*With a plate*).

PARAVESPA EVA.

♀. Head, thorax, abdomen, including petiole, thinly pubescent, the pubescence longest on thorax and last three segments of abdomen and more or less golden on the last three segments, brown or silvery everywhere; head, pro- and meso-notum, scutellum, postscutellum and median segment very minutely punctured; clypeus very long, pointed, anteriorly carinated down the middle; median segment vertical, very obscurely rounded—carinate in anterior half along dorsal line, with a thin, also somewhat obscure furrow in continuation, in posterior half. Colour black with the middle third of petiole above and more extensively beneath ferruginous, the legs also having a ferruginous shade though otherwise black and the last three segments of abdomen being also light rusty; mandibles black, strongly three-toothed (see fig. 1 of plate), the ends of these teeth slightly ferruginous; antennæ black with stipes and last segment ferruginous; distal end of clypeus black, the rest as far as base of antennæ and the eye-sinus yellow; tegulæ dark brown; the following yellow markings; scutellum yellow except for a thin dorsal line and narrowish hinder margin (which are black); a thin band along front margin of postscutellum occupying about half the breadth of segment; a broad stripe on each side of median segment, a broad stripe on posterior margin of pronotum, a spot beneath each wing with a larger, lunulate one below that; the base of the second segment of abdomen broadly, the third segment similarly but more narrowly banded along front margin, this band interrupted in dorsal line and the fourth segment similar to third but the yellow hardly visible because of being telescoped into third; ventrally there is a small spot on each side of medial line near the middle of segment 2 and a large spot larterally near front margin of segment 3 that looks like a continuation of the band along its dorsal front margin; the yellow front of segment 2 is produced laterally backwards to make a spot symmetrical with this last; the tibiæ of legs dorsally yellow. Wings hyaline with a very slight yellowish or brownish shade, the whole of the radial cell very dark, nearly black, suffused downwards to fill the outermost cubital cell.

♂. Exactly similar to the female except that there are seven abdominal segments instead of six (including the petiole) and the terminal joint of the antennæ is strongly suffused with black.

Habitat.—N. Kanara District, Bombay. ♂ ♀. *Length* 20 mm. and slightly over; especially up to 33 mm.

In Bingham's *Hymenoptera,* vol. i, p. 377 of the *Fauna of British India* series, this species would come in under division A as follows:—

A. Colours black with yellow or red markings.
  a. Head and thorax black with yellow markings.
    a′. Clypeus yellow with an irregular medial space black, not reaching its apex; median segment with a reversed T-shaped yellow mark on each side ... *micans.*
    b′. Clypeus yellow without black medial space, median segment with a yellow spot on each side at apex. *fraterna.*
    c′. Clypeus black with small central yellow spot; median segment immaculate black ... ... *scitula.*
    d′. Clypeus yellow, except for a broadish black border reaching from apex to eye on each side, including apex; median segment with yellow, broad lateral stripe on each side ... ... *eva.*
  b. Head and thorax black with red markings ... ... *rufomaculata.*

B. Colours rufescent brown or ferruginous with yellow markings.
  a. Median segment very finely transversely striate ... *nigrifrons.*
  b. Median segment smooth.
    a′. Median segment with vertically impressed medial line; length 12 mm. ... ... *nitidipennis.*
    b′. Median segment smooth throughout; length 18 mm. *eximia.*

As far as we are aware, *I. eva* is the only species of the genus that exists in India proper with the exception of Sikkim and its neighbourhood: *micans* reaching from Sikkim through Burma to Borneo; *scitula* from Sikkim to Assam; *fraterna, rufomaculata, nigrifrons* and *nitidipennis* are found in Tenasserim in Burma and *eximia* is confined to Ceylon. *Eva* so far is only known from the Kanara District in the Bombay Presidency where it apparently keeps to the forest-clad hills of the Western Ghats. It is there found from practically sea-level up to the tops of the hills which, however, do not reach to more than 2,600 ft. except for two small areas where a peak runs up to, at the most, 3,500 ft.

The wasp builds an absolutely unique pattern of mud nest very similar to that of *Ischnogaster eximia*, Bingham, first collected by E. E. Green in Ceylon and described by Colonel Bingham in the *Journal of the Bombay Natural History Society,* vol. v, p. 244, with an accompanying plate depicting, fig. 7, the nest. The description is repeated in Bingham's *Hymenoptera,* vol. i, p. 377, published seven years later in 1897. When I originally discovered my species in Kanara, I recognised it must be either the same as Bingham's or very closely related to it. His is 'dark rufo-ferruginous', mine is black and both have very similar yellow markings. His *eximia* has 'mandibles simple' and unidentate claws, both characters that make it abnormal for the family *Vespidæ*, but normal for its first genus *Ischnogaster* (itself abnormal for the family in possessing dentate claws). My species is abnormal for the family in the one character of the dentate claws and for the genus *Ischnogaster* in having the mandibles toothed as in the family. I met Colonel Bingham in 1908 in London and showed him my wasp and the plate accompanying this article (depicting fig. 1 the mandible, fig. 2 the nest and fig. 3 the imago) and, notwithstanding that I pointed out to him that my insect had *toothed* mandibles, he said it was *eximia*, ignoring this character and the difference in colour. It struck me from what he said that he thought he might possibly have made a mistake in describing the mandible of his species as 'simple'. Naturally I thought that Colonel Bingham must be right and from that day to this my specimens have lain in my collections unnoticed until this year (1935). For reasons given above I now know that my wasp is not *eximia* but differs from it in many characters other than colour and mandibles as may be seen by anybody taking the trouble to compare the two descriptions. I have just lately, within the last two months, December and January, collected some 13 or 14 specimens in the imago—and pupal state and three pupæ have produced imagines in the bungalow from nests collected outside—there are still some pupæ left to yield wasps. A Mantis, *Gongylus gongyloides*, kept in one of the cages with a nest, killed and demolished one imago without my being able to rescue it.

The nest is one of the most graceful bits of architecture conceivable, light as a feather and excessively fragile, built by the insect, small particle by particle of earth, brought on the wing and mixed with glutinous saliva to ensure adherence. It is invariably attached by the upper end to a dry and often nearly rotten rootlet hanging from the roof of a cavity in a bank in the jungles. When completed it hangs quite free and is never less than a couple of feet off the ground beneath. It resembles in shape an inverted pear with a lowly conical top and a cylindrical end that forms the entrance to the abode. The junction of sides with the roof is more or less angular but the other contours are gracefully rounded. The roof is low conical with the slope at an angle of about 45°, the bottom is a short tube made of little earth-pellets with interstices to resemble filigree work and the entrance at the bottom is ornamented, further, with an expansion, executed so as to resemble the distal half of a pointed leaf, extending well beyond the tube and as long as it is wide, embracing with its base the actual entrance-hole—a sort of platform for the insect to land upon when it arrives home. This structure is further ornamented with a dozen low, rounded, longitudinal flutings extending the whole length and each alternate fluting has a lowly prominent ridge down its middle which is expanded outwards to a height of about 5 mm. into a thin triangular wing, deepest above in the horizontal plane of junction of sides with roof, about 10 mm. long, losing itself gradually in its ridge below; occasionally the wing on a particular ridge may be omitted and, as an expression of the exuberance of fancy animating a particular architect, there may be an extra wing, along one of the ridges continued onto the roof near the point of attachment. Inside this wonderful house are the cells, all built in a single series on the roof, all perfectly hexagonal, one against the other, 5 mm. in diameter by about 14 mm. in depth with very thin walls and well-smoothed interiors. All a truly wonderful piece of handiwork no parallel to which I have ever seen elsewhere. The nest resembles a delicate reproduction of a shell of the genus *Voluta* amongst the mussels. It also reminds one of a suspended bat when placed in a darkish corner and real bats are common enough in such places. The flutings on the outside correspond at their origin to the contours of the outer row of cells inside.

The largest nest I found was 80 mm. by 60 mm. over all, the entrance tube with its expansion taking up 20 mm. of the former while the prominence of the wings when existing is not included in the 60 mm. The diameter of the filigree tube is 10 mm., its length about the same. The smallest nest measured rather under 60 mm. by 40 mm. and contained only 14 cells. In the larger ones there are up to 21 cells and those forming the outer row appear always to be 12 in number which explains the number of the longitudinal flutings always present on the outside of the structure. The cells that have been inhabited can always be recognised by their mouths bearing remains of the covering (only a partial affair as a round aperture is always left in the centre) woven by the larva or grub when it 'spins' itself up before turning into the pupa. I have never found more than five of these used cells in any nest, new or old and, including all found, that means at least a couple of dozen examples. The wasps from one nest emerge at intervals of at least a week, often much longer. The building up of the entrance is presumably necessary to hold the pupa in place as, naturally, the cells being on the roof of the nest, these pupæ all lie with the head downwards. The head is held so that the face lies against the side of the nest, the abdomen is folded in against the sternum of the petiole and median segment and the cell opening is of much smaller diameter than the head and thorax.

Kanara is on the Western Ghats about 15° north of the equator and has, at Karwar, a yearly rainfall of 125 in. Inland, towards the crest of the Ghats, this may rise to 350 in. in certain places; in exceptional years it may even go to 450 in. and above and 150 in. on the sea-coast. The wet zone does not extend to more than at the outside 60 miles inland after which the rainfall rapidly diminishes eastward. At 60 miles inland it is, say, about 80 in., at 80 miles it is not over 25 in. The vegetation is Malayan in type in the wet parts, eastward it is all Deccan flora which means that the Ghats are largely covered with evergreen forests, the eastern country with deciduous species. The whole district is fully 85 per cent forest.

The insect under consideration is found only in the damper areas and the places where it first came to notice were cuttings in the sides of roads which were excavated to get the earth for annual repairs to their surfaces. Many of these are quite deep and shaped like the commencement of burrows and it was on the roofs of these that nests were originally discovered; the inhabiting wasps were at first only recognized as the architects of a beautiful mud nest. Later on specimens were collected and kept as adjuncts to the nest. That was forty years ago. There are many fine roads in Kanara running from the sea-board through the Ghats to the Deccan so that there was no lack of hunting ground in which nests could always be found; but, of course there are plenty of natural hollows in banks inside the jungles that are also used as building-sites. The particular requisites in the choice of a spot for the wasp seem to be a certain degree of humidity, absence of direct sunlight and a suitable 'roof' with rootlets hanging from it.

In no case has there been more than a single nest in any one cutting. In no case have there been more than three wasps in and around any nest and, in the single case of three, one insect had certainly only just been born. In no case have any of the wasps caught 'wild' (which means at nests in the jungles) been other than female. In the last batch of insects obtained wild or bred in the bungalow from nests brought home there has not been one of the male sex.[1] I conclude from this that the male does not assist in the construction of the home, neither does he ordinarily help in domestic affairs any more than do the solitary wasps of the family *Eumenidæ* immediately preceding these *Vespidæ*. These two species *eva* and (by general analogy, it is nearly certain) Bingham's *eximia* are, to all intents and purposes, 'solitary' wasps like the *Eumenidæ* and, although more like *Vespidæ* in most respects, they constitute a link between the two families abnormal in possessing characters of more than generic value differentiating them from both. Bingham mentions this in the case of his *eximia* and, in another way, for the whole genus *Ischnogaster*. This genus is abnormal for the *Vespidæ* in that it possesses dentate claws (the family has simple ones).

I think the best way out of the difficulty would be, to obviate the necessity of making a new family for the exceptions, to divide the family *Vespidæ* into two sections:—

1. The perfectly normal insects.
2. The insects that are abnormal in one or more characters.

Under 2 would come the genus *Ischnogaster* and the two species *Eva* and *eximia* for which I suggest a new genus to be called *Paravespa*, as follows:—

Insects with unidentate claws, normal mandibles and of normal social habit	*Ischnogaster.*
Insects with unidentate claws, mandibles simple or normal (toothed) and of solitary habit	*Paravespa.*
Mandibles normal, claws abnormal for family ...	sp. *eva.*
Mandibles abnormal as well as claws	sp. *eximia.*

As a matter of fact these two wasps with their equivocal characters outlawing them from any existing family, should have had a family of their own, but one hesitates in introducing such a thing into the old and well established hierarchy of tribes, families and genera of the *Hymenoptera* we have been accustomed to recognise and work with for so long in the past.

The *Paravespa* wasp starts building operations at the commencement of the monsoon, in June in Kanara and goes on until about the end of January next with a lull in the months of February to next June necessitated, I have little doubt, by the lack of moisture in the air and paucity of prey and pabulum; probably chawed-up caterpillars. The new-born wasps, bred in captivity, spend a day or two after emergence in the nest and are very sluggish when they come into the open and, without food, only live for a day or two; when fed with sugar they live but a short day longer.

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[1] It was only after I had written the above that I bred two males from nests; the total number of wasps caught at nests and bred from them was 15; none of those caught at them were males.

REVIEWS.

I. MAN: A SPECIAL CREATION. By Douglas Dewar, B.A. (Cantab.), F.Z.S. (Thynne & Co., Ltd., London, 3/6).

This little volume (pp. 123), like many others of its kind which have appeared from time to time since the publication of Darwin's *Origin of Species* and *Descent of Man*, has the definite purpose of questioning the validity of the theory of organic evolution in general and of Man's animal descent in particular, and of asserting that all the varied forms of life including Man were created by a special act of God in the not very remote past. Within the limits of space available for a review, it is impossible to deal adequately with all the arguments advanced by the author against the theory of organic evolution, and in consequence, the review is mainly confined to a summary of the work.

This little book is divided into six chapters. In the first the author points out that modern scientific classification compares very unfavourably with that adopted in the Book of Genesis in regard to the position of Man in the animal kingdom, and believes that scientists have purposely ignored certain anatomical and mental characters of Man which militate against the acceptance of the theory of Man's primate ancestry. In the next two chapters the author goes on to show that Man's descent from a non-human ancestor has not been proved, and that all the evidence brought forward to prove this theory makes undue demands on the credulity of most intelligent men with a legal as well as a scientific training. The claim of the evolutionists that the difference between the brain of Man and that of the ape is one of degree and not of kind is not accepted, and the evolutionists are challenged to produce by selective breeding of monkeys 'an intellectual giant among its fellows' if the creationists are to be satisfied. The existence of divergent opinions in regard to the descent of Man from an ape-like or other ancestor is attributed 'to the fact that there is no evidence to go upon'. In the third chapter the author examines the various theories held in regard to the origin of human language, to the anatomical peculiarities of Man such as the upright posture and the bipedal gait, and to the psychic gulf that exists between Man and the rest of creation. In the fourth chapter, which is the longest, a great deal of criticism is levelled against Darwin, and against the indirect evidence he and his followers put forward in support of the theory of Man's animal descent. The insufficiency of the evidence adduced is examined under five headings viz.: (1) the anatomical and physiological resemblances between Man and the Primates; (2) the method of Man's embryonic development; (3) the vestigial organs in Man; (4) the supposed reversions of human organs to an ancestral state; and (5) the blood serum reactions of Man. After a lengthy but unconvincing discussion of the topics under each of these headings, the author concludes that the indirect evidence adduced in support of the theory of Man's animal descent is exceedingly weak, and is not opposed to the theory that Man is a special creation. The fifth chapter is devoted to the examination of the causes which led to the wide and ready acceptance of the theory of Man's animal descent, amongst which may be mentioned (1) that amusement is derived by the average biologist in solving the biological cross-word puzzles of the theory of evolution; (2) that the theory of evolution is the life-blood of the rationalists and the materialists; (3) that the literary skill and persuasiveness of the supporters of the theory in expounding it to the public were responsible for the popularity of their views. What surprises and pains the author most is the fact that eminent men, scientists to boot, who have been most vehement in attacking the mode of operation of the theory as propounded by Darwin and his followers have retained their belief in evolution as a settled fact. He is, however, satisfied that the recent Evolution Protest Movement under the leadership of Capt. B. Acworth and Sir Ambrose Fleming will not make it easy for weak-kneed protestants to succumb to the casuistry of the clever evolutionists. In the last chapter the author reiterates that the evolutionists have failed to produce demonstrable evidence from the study of fossils and from experiments in breeding to prove to the satisfaction of the creationists that Man originated by a process of evolution. The evidence which he brings forward to prove the theory of man as a special creation is classed as scientific, under the headings—anatomical, psychological, palæontological, and biblical, but none of these are elaborated to show clearly that Man cannot be included in the general scheme of evolution of all living things. There is much irrelevant matter included in this chapter as for instance, amongst others, the accusation levelled against H. G. Wells as a plagiarist by a contemporary woman author.

The book is, however, well worth a perusal as both the matter and manner of presentation are interesting. The printing and get-up is good, and a glossary at the end helps the lay reader to understand the technical terms.

H. S. R.

II. GLIMPSES OF THE WILD. By Lt.-Col. H. S. Wood, I.M.S. Pp. 180; with colour and monochrome plates. London, H. F. & G. Witherby, 1936. Price, 8*s*. 6*d*.

Lovers of nature and newcomers to India will delight in the reading of *Glimpses of the Wild* in which Lt.-Col. Wood deals with the more common denizens of Indian rivers, hills and forests: animals, birds, reptiles and insects—not all of them, but those he has come to know or even to befriend in his rambles. The author's style is simple and pleasant; his descriptions are not crowded with useless details; and his selection of illustrations is excellent. In fine, a very readable and attractive book.

Old timers may be to some extent disappointed for, somehow, they will all along carry the impression that they have heard the story before. As for the men of science they will, no doubt, be horrified at some of the phrases and statements. But, before passing any adverse criticism, let them remember that the book has been written by a 'non-scientific observer' (p. 179) and is intended for 'young naturalists' and for 'those who visit India for the first time' (Preface).

J. F. C.

III. A SHELLAC PATENT INDEX. By R. W. Aldis. Pp. iv+115. Indian Lac Research Institute; Namkum, Ranchi, Bihar and Orissa, India; August 1935. Price, Rs. 2-8.

This valuable compilation ought to be in the hands of every one interested in the manufacture and uses of shellac and its synthetic rivals.

The author is to be congratulated; but not so the binder.

J. F. C.

IV. WILD ANIMALS OF THE INDIAN EMPIRE AND THE PROBLEM OF THEIR PRESERVATION. By the Bombay Natural History Society. With coloured and black-and-white illustrations (Diocesan Press, Madras). Price, Rs. 2 per part.

Having gone through the four parts of the *Wild Animals of the Indian Empire and the Problem of their Preservation* published by the Bombay Natural History Society, I feel that all the Naturalists and Sportsmen in India are under a heavy debt of obligation to the Society for this fine work. The problem of the preservation of wild life in a country like ours is complicated by the fact that the average man takes little or no interest in Natural History. Hence it is very pleasing to see that in these books, before the problem of preservation is discussed, a full account of the Wild Mammalia is given, calculated to generate and foster an abiding interest in them. The value and the importance of the work is greatly enhanced by the many beautiful plates which are included in these volumes.

Whenever the need for the protection of Wild Life is mentioned, it is customary for people to look to Government legislation and enforcements. But before any Government legislation can be enacted and successfully carried we have to remember two important facts:—

Firstly, most modern governments appear to be unwilling to bring into legislation any subject which is not supported and demanded by a strong public opinion.

Secondly, even if such a legislation has been effected, however much it can and may help in the endeavour, anything like practical success is possible only if there is a strong public opinion demanding it and co-operating with Government.

For this end, viz., the formation, development, and strengthening of public opinion looking upon wild life with interest, sympathy and a fair amount of knowledge, these four delightful volumes are, I believe, well suited.

These well-got-up volumes, each I believe sold by the Society for the very nominal price of Rs. 2 which must be only a small part of the actual cost of production, should be a cherished and proud possession in every cultured Indian home to tell us of our forest denizens, and to make us love them. Loving them, much of that indifferent callousness and hatred begat of selfishness, greed and ignorance, will, I trust, disappear.

I wish these Volumes wide popularity and great usefulness in serving the purpose for which they have been conceived and intended.

A. P. M.

AN APPEAL.

WANTED INFORMATION ABOUT CUCKOOS.

To the Editors,

The Journal of the Bombay Natural History Society.

Dear Sirs,

I am hoping within the next few months to commence a book on Cuckoo problems, a subject in which I have been interested for more than 50 years, in spite of which I find that there is still an extraordinary lack of evidence on many material, yet in some cases, simple points. May I hope for help from our readers?

Here are a few of the points which still require elucidation in whole or part:—

Desertion of nests in which cuckoos' eggs have been deposited.

Ejection of cuckoos' eggs from the nests of the foster-parents.

These are simple points, yet not easy to generalize on from the evidence so far in existence. Most of us find our nests when the owners leave them and so disclose their whereabouts; if deserted there is no owner to leave and the whereabouts are not disclosed. Simple questions, yet very difficult to answer satisfactorily.

Extent of habit of ejection. We know that all species of *Cuculus* have this habit. We also know that some species of *Clamator* do not eject eggs of the foster-parent or their young. We do not, however, know yet to what extent *Hierococcyx*, *Penthoceryx*, *Cacomantis* and other genera have or have not this habit. We do not even know to what extent the Koel has it, *if at all.* Nor have I been able to ascertain whether the newly hatched young of all these species possess the physical attributes (hollowed back, etc.) which would enable them to practise this habit. It would surely be easy to ascertain if the young of the Koel, the Brain-fever Bird (*H. varius*) or *Clamator jacobinus* possess the hollow back.

Rearing of multiple young. Mr. A. J. Cronil has published a few notes on this matter, and a few others are scattered here and there in journals and elsewhere; but still comparatively little is recorded. Does, or can, a pair of 'Seven Sisters' bring up more than one young Hawk Cuckoo and, if so, how many?

Deposition of eggs. It has been found that some cuckoos lay direct into nests and circumstantial evidence shows, and indeed proves conclusively, that many eggs are found in nests in which they cannot have been laid direct. Quaint methods of deposition have been suggested; and deposition has actually been described as having been effected by an elongated vagina working like an ovipositor, yet no dissection of the bird seems to have been made to expose the impossibility of this act.

Much must have been done of which I am doubtless ignorant; but far more still remains to be done. I shall be very grateful for any notes and any material which may be sent me, and these will be acknowledged when received and, of course, in the book when and as they are made use of. Especially shall I be glad to receive eggs and full notes on the breeding of the Plaintive Cuckoos round Hyderabad in the Deccan.

Yours hopefully,

E. C. STUART BAKER.

6, Harrold Road,
Upper Norwood, S.E. 19.
February 24, 1936.

MISCELLANEOUS NOTES.

I.—ROOSTS OF FLYING FOX.

While going through the past volumes of the *Journal*, I came across Mr. McCann's very instructive article on the Flying Fox (*Pteropus giganteus* Brünn), *J.B.N.H.S.*, vol. xxxvii, No. 1, p. 143. Among other things, he has recorded some colonies of this animal. In this connection, the undernoted information may be found useful.

(1) About 56 miles north of Ahmedabad, there is a town called Unjha (a Railway Station) in North Gujerat. On the outskirts of it, there are several Tamarind trees, which have been the abode of the Flying Fox for at least the last 30 years. The trees stand within the town, and nearby is a big tank, a scene of bustle and noise throughout the day. Still the bats occupy the trees year in and year out undisturbed. I have no knowledge whether the same animals have been living there or whether new-comers are added to the colony from time to time. But this much is certain, viz., that these trees are always occupied.

One thing in this connection puzzles me: the source of their food supply. There are no orchards here, nor are there any fruit-bearing trees. The whole country-side is pincipally an agricultural tract, interspersed with *Acacia* trees.

(2) Another colony I have found right in the city of Ahmedabad. There are several Tamarind trees in front of the Victoria Gardens, at the foot of the Ellis Bridge. Until a few years ago, one of these trees was the permanent residence of Flying Fox. I first saw them there in 1914 when I came to Ahmedabad. I cannot say how long they had occupied this tree previous to 1914. It took all the ingenuity of the municipal staff to remove them from their quarters. This was done in 1932, yet for eighteen years, to my knowledge—and how long before, I do not know—the bats lived in the heart of a big city, where noisy traffic passed under them throughout the day.

It is interesting to record that in an adjacent tree—also a Tamarind—there was a colony of Egrets living apparently on good terms with the bats. When the Flying Foxes were forced to vacate their home (the Egrets also went: where I cannot say). About a couple of hundred yards north of the Victoria Gardens, there are Government buildings occupied by the Court of the City First Class Magistrate. There are several trees in the compound of this court house, out of which eight are at present occupied by Flying Foxes. They comprise:

गू. पींपळो Pipal tree: *Ficus religiosa.*
,, पींपळ Pipal tree: *F. tsiela.*
,, . लीमडो Nim tree: *Azadirachta indica.*
,, अरडूसो Heaven's tree: *Ailanthus excelsa.*

At Patan (North Gujerat), several trees—mostly Tamarind and Banyan—have been the abode of Flying Foxes for about 25 years.

Hibernation.—It is believed that the Indian Bats hibernate. This is not altogether correct—especially for North Gujerat bats. During the last three months I have daily found the cheerful Indian Pipistrelle (*V. abramus*) hawking insects from early evening in company with their inseparable friends—the swallows. But I thought that the case of the Flying Fox was different. I had, during December and January, several times visited the colony mentioned under item 2 above—as late as 11 p.m. and as early as 5 a.m. The animals were still there, wrapped up in their shrouds and sleeping undisturbed. They never appeared to leave the place nor were found arriving as they did in summer. Hence I concluded that at least these fruit-eating bats did hibernate in North Gujerat.

Now I find I was mistaken in this belief. Because, for the last six days, I see Flying Fox passing my window daily in the evening, going from west to east. They come incessantly for about thirty minutes in large numbers. Once I counted up to 200 and then lost the count. Whence they came and where they were going I cannot say. Also I am not in a position to say that they were the same as No. 2 colony above. But this at least shows that Flying Fox also comes out in winter.

NAVO VAS, DANAPITH,
AHMEDABAD.
January 31, 1936.

H. G. ACHARYA,
F.Z.S., F.R.G.S.

II.—MELANISM IN WILD DOGS.

Mr. V. G. Darrington, I.F.S., the District Forest Officer, Coimbatore North, saw a black wild dog at Gaddesal, in the North Coimbatore Division, on the 11th instant. With the exception of a white tip to its tail the dog appeared to be completely black and was unmistakably a wild dog. I wonder if an instance of such complete melanism in a wild dog has been recorded before.

HONNAMETTI ESTATE,
ATTIKAN P.O., *Via* MYSORE,
S. INDIA.
January 14, 1936.

R. C. MORRIS.

III.—LEGENDARY METHOD OF HUNTING IN WILD DOGS.

As a pendant to Mr. Livesey's interesting note on the behaviour of the Indian Wild Dog (*J.B.N.H.S.*, vol. xxxvii, No. 2), I can confirm the belief among native villagers that these dogs make use of their urine to blind game they are hunting. I was most solemnly assured by one of my mahouts, when stationed at Baksa Duar, that these dogs urinated on their tails and then, running ahead of their quarry, flicked their tails towards the animal's face.

Also I was told, on several occasions, a habit of theirs which seems far more credible, and that is, when a pack arrives at a new hunting ground, its members go round the boundaries of the portion they mean to work, urinating at frequent intervals, because —so my informants told me—all wild animals, which the dogs hunt, are so terrified of the enemy that they will never cross a point where they can smell the taint of the dog's presence.

May I congratulate you on the continued excellence of the *Journal*? It is a quarter of a century since I left India, but I enjoy my *Journal* as much as ever I did when shooting, fishing, or egg-collecting in the country.

CATCOTT, *Near* BRIDGEWATER,
SOMERSET.
January 2, 1936.

ARUNDEL BEGBIE,
Lt.-Col.

IV.—SOUND LISTENING FOR TIGER SHOOTING.

INTRODUCTION.

It is with trepidation one ventures to put forward an article on tiger shooting as the subject has been so widely written upon by famous sportsmen. This article is only put forward to help the young and keen tiger 'shikari'; and my reason for doing so is due to a conversation I overheard the other day. I have heard so many similar remarks and pathetic descriptions of failure, through lack of knowledge. All the good books on tiger shooting give one full particulars of how to run a beat, but none that I have read give one advice of how to find out, as far as it is possible in this kind of sport, whether the tiger is really in the beat after he has killed the tie up. Hence my reasons for this article. I feel I must repeat the conversation before I get on with the meat of the article.

CONVERSATION.

'Raifal', a keen young 'shikari' back from a tiger shoot. 'Blanderbast' (known as *B.*) an old hand at the game.

B.—Well young man—What luck?

R.—None at all, had three kills—all in beatable places, no tiger in any of them.

B.—Dodged the stops or broke back?

R.—No, never in the beat at all. I am fed up as I spent a packet on beaters, shikaris, etc.

B.—Shikari venture any information for tiger not being in beats? Did he seem surprised when they did not appear?

R.—No. Just said it was Kismet and that the Saheb was not liked by the Gods.

B.—What did he or you do to ascertain whether the tiger was in the beat before you had your beat?

R.—We walked round the beat to look for pug marks going in and out of the beat, but the ground was so hard and stoney that it was very difficult to see much.

B.—You did nothing more before beating to discover whether the tiger was there or not?

R.—No.

B.—Well, you did not do much and I am not surprised you have been unsuccessful.

The above makes one feel sorry for the youngster, as he is ignorant of a few hints which would have been very valuable to him, had he read them anywhere before going out and he would have felt that he had not wasted all his hard-earned savings on learnings and been disappointed.

Sound Listening.

Its object is to locate the tiger after he has killed near a beatable area. On hearing these words, one is apt to get alarmed and think that one has got to deal with complicated wireless apparatus, or some machine to discover the whereabouts of submarines, or some other fiendishly clever invention. Far from it. This scheme has only to do with human beings and is as simple as adding the proverbial 2 and 2. It is put forward because it is so simple, and with experience is found to be almost infallible.

Requirements.

Two men fairly intelligent in jungle lore, two pieces of cardboard from 6 to 10 inches square, two pencils and a ream of foolscap paper, two khaki drill bags to carry the pieces of cardboard in the forest, one cheap watch (this is not absolutely necessray, as Indians are fairly good about the time of the day).

Instruction.

Can start anywhere, in one's own bungalow, or while one is out in the forest. One point to remember is to choose men who are conversant with the different sounds made by the animals, and one can be assured that most of the jungle folk anywhere in India are good at this.

Choose a piece of ground representing a beat, with two trees somewhere near the base. Place your men with their backs against the trunks facing the direction of the line of advance of the beaters. This is not essential, but is only suggested for simplicity's sake. The men can be placed anywhere surrounding the beat. Put the foolscap paper on to the cardboard, give it to the men with pencils and make them face the direction of the beat. In the centre of the nearest edge of the paper draw a blob representing the tree, make the man set his paper. Inform him that in a certain direction a cheetal called at 11-00 a.m. Make him draw a ray in this direction and put down roughly how far away he thought it was. In practice the range has to be given. Other rays can be drawn in this manner. Explanation makes it clear that this is what they—the men—have to do after a kill has taken place. Each man works on his own as the Indian is rather apt to feel insulted if he realises that another man is doing his work. Also he is liable not to do the work when the opportunity arises. The final drawing is done by combining the two cards. The base of the triangle is known on account of it having been measured before, then where the rays on each card cross on the main card is the rough area in which the tiger has been located.

METHOD.

The object, as stated before, is to locate the tiger after he has killed. In order to put this plan into action one must have some sort of idea what are the habits of tiger. Roughly speaking, the habits of a tiger after he has killed are, drag the kill to some secluded spot, feed (depending on the time), move off to his drink, return and lie up somewhere near the kill if the jungle is good holding jungle, from where he can watch his kill and keep off all carrion.

In the hot weather the tiger seeks the cool and the shade and more often than not will lie in water during the hottest part of the day. He does not move about very much unless water is very near his kill in the heat of the day.

In the cold weather the forest is generally heavy with dew till late in the morning; and due to it being cold, the tiger meanders about for quite a while, even to the extent of climbing a hill near his kill to obtain the warmth of the sun. He generally returns when it gets hot and lies up in the cool and shade and somewhere near his kill if the forest is thick and not likely to be disturbed. It is during these movements that touch must be kept with the tiger, as he may very easily, like a defeated enemy in war, slip right away and not return to the beat. Thus this *sound listening* is strongly recommended. To put it into action.

One assumes that the beat has been reconnoitred beforehand. The tie up has been killed and dragged as far as can be ascertained in the direction of the beat. Do not let anybody follow the line of the drag. One can generally see which way the tiger has taken the tie up. The report reaches camp. The sound listeners, having fed, are taken out, shown the piece of ground placed in their respective trees with their apparatus, with full instructions and emphasis about no noise or talking. Any noise must be reported and the ray drawn. These men must stay in their places till one returns to beat, as information can be had up till the last minute and sometimes very valuable information. If there are several rays in each diagram, then one can be contented. If there are none, the best thing to do is to give up the idea of beating and return to the attack the next day, as it means that the tiger has taken up his abode somewhere else.

(I have assumed that there will be animals in the forest, and as one knows that when a tiger moves every animal and bird who smells or sees the tiger gives tongue to every sort of cry.)

CONCLUSION.

I trained some of my Regiment in the above work and they became so keen that in order to make no mistake each man bought a ruler on his own and produced drawings of the utmost accuracy. This is not necessary! Reports were always clear and I found that I saved a lot of money on beaters, and also what was more valuable, time. I think that I can honestly say that this method practically never failed. The tiger may have got away but this was the fault of the gun or stops and not of the sound listeners. I am a great believer in silent beats. By this I mean the beaters shout twice before they start beating, once to wake the tiger up and the other to get him moving. During the beat itself, tapping is the only noise one hears.

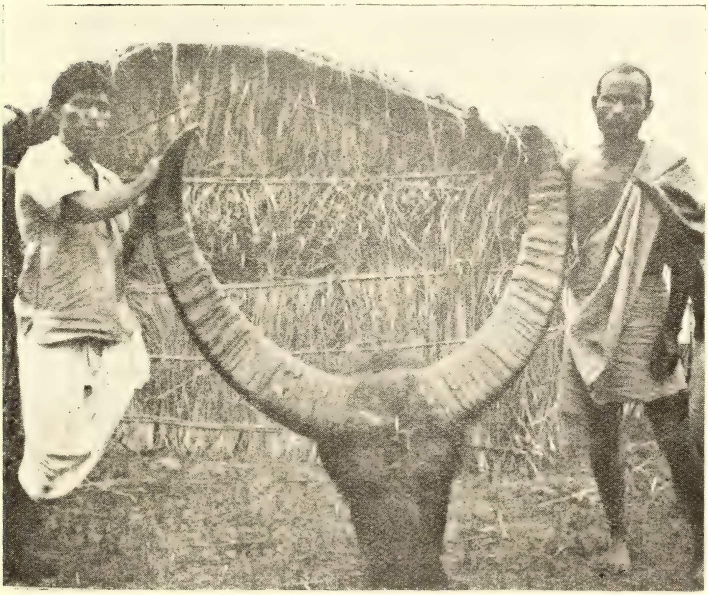
I realise that I am in for a lot of controversy, but am only too willing to answer any reasonable questions.

GOVERNMENT HOUSE,
BOMBAY.
February 9, 1936.

J. TOOGOOD,
Lt.-Col.

V.—MEASUREMENTS OF A BUFFALO-HEAD FROM ASSAM.

(*With a photo*).



The photograph above is the head of a bull buffalo I recently shot in the Mangaldai District of Assam, which possibly comes in the record class, and I should be grateful if you would advise me in the matter, The measurements, by steel tape, which have all been checked and witnessed, are as follows:—

Tip to tip across forehead	118½ in.
Right horn	53 in.
Left horn	48 in. (broken)
Maximum girth	23 in.
Maximum spread	46 in.
Height at shoulder	6 in.

You will observe that the maximum spread is very small indeed, but the girth as far as I am able to trace appears to be a record. Unfortunately, I cannot get hold of the latest edition of Messrs. Rowland Ward's *Records of Big Game* to compare these measurements.

If the left horn had not been broken, the tip to tip measurement would have been approximately 123 in., and this seems to be a fine head for these days.

It may interest you to know that this buffalo was with a herd of eleven cows some miles from any reserve, had killed three men and badly injured a boy within recent months and was said to have been 29 years old.

CALCUTTA. R. G. GRIFFITH.
April 1, 1936.

[The Record head of the Indian Buffalo has a horn length of 77¾ in. and a girth 17⅞ in. This is the head of a female now in the British Museum. The largest recorded head from Assam (Rowland Ward) has a horn length of 70 in.; circumference 18½ in.; widest span between horns 67¾ in.; tip to tip 60 in.; widest outside 72 in. The maximum girth measurement so far recorded for the horns of a Buffalo is 22 in. This of a head with 60 in. horns. Shot in the Central Provinces.—EDS.].

VI.—BISON AND PANTHER.

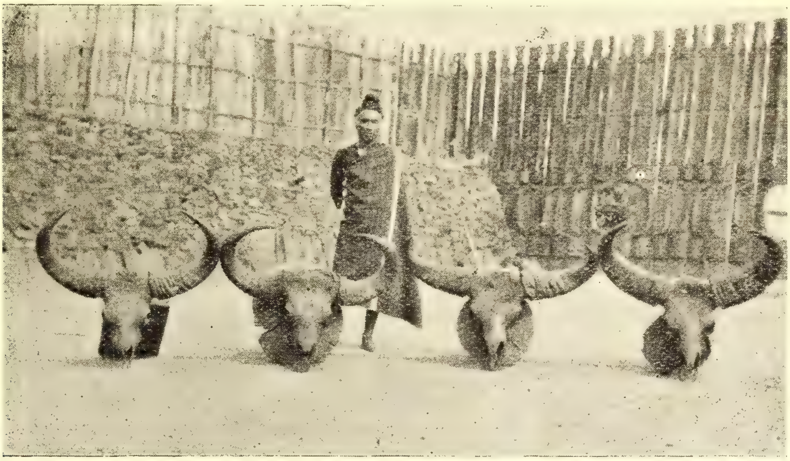
A rather interesting incident occurred last night while I was sitting up over a panther kill with Col. R. P. Warwell. A herd of bison happened to come grazing along while the panther was feeding on its kill. As soon as the bison scented the panther the herd commenced to converge slowly on the kill in a rough half-moon formation snorting and bellowing. Had I been alone I should have waited to see the outcome but my guest wanted a panther badly and shot it before the panther had even time to show signs of uneasiness. The bison did not seem to be much disturbed at the shot and remained around in the vicinity for some time.

HONNAMETTI ESTATE,
ATTIKAN P.O., *Via* MYSORE, R. C. MORRIS.
S. INDIA.
January 15, 1936.

VII.—GAUR-HEADS FROM THE CHIN HILLS.

(*With a photo*).

It is generally believed that you must have a 'cordite cannon' to shoot bison with. But this photograph from south of Haka in the Chin Hills shows what magnificent beasts have fallen to the humble flint-lock with soft lead bullets and home-made black powder.



A SPORTSMAN IN THE CHIN HILLS—MAGNIFICENT BISON HEADS SHOT WITH A FLINT-LOCK !

All heads are over 40 inches. The widest is 46 inches and the longest round the horn 37 inches.

All four heads are well over 40 in. in span, and the second from the right was 46 in. across. The second from the left measured 37 in. along the outer curve of each horn. All were of great girth.

Nowadays such great heads are rare in Burma when yearly guns increase and game decreases.

Then huge, slab-sided cattle are vulnerable to almost any weapon if taken through the heart from the flank and the great bones and muscles avoided.

A Chin Chief stands to his trophies as he did in the chase—a fearless and a perfect gentleman.

TAUNGGYI,
BURMA. T. R. LIVESEY.
March 6, 1936.

VIII.—SEASON OF HORN DEVELOPMENT IN SAMBHUR.

Mr. A. A. Dunbar Brander writing on sambhur in his *Wild Animals in Central India* mentions that he had never heard of sambhur being in full horn in August or September.

In 1933 I shot a stag in full horn in September and saw another. This year, a large number of stags in this District (the Billigirirangans) were in hard horn during the second half of August and in September. Mr. H. G. M. Dunn, R.A., shot in the first week of September a fine stag which had certainly been in full horn during the latter part of August. This has been followed by a very early shedding of antlers in February this year instead of March and April as is usually the case.

HONNAMETTI ESTATE,
ATTIKAN P.O., *Via* MYSORE,
S. INDIA.
March 30, 1936.

R. C. MORRIS,
F.Z.S., F.R.G.S.

IX.—'CUCKOO-LORE'.

1. In Lt-Col. R. W. Burton's article on this subject there are certain statements which require qualification. 'Sometimes when the nest is large enough and favourably situated she will lay her egg in it, but in probably the large majority of cases she lays her egg on the ground and introduces it by her bill into the nest.' (*J.B.N.H.S.*, vol. xxxviii, p. 268.)

Most field-workers, finding cuckoos' eggs in small and awkwardly placed nests, especially those in which the hole is at the side, have inferred that the egg must have been introduced by the bill. Mr. E. P. Chance, Captain O. G. Pike, Mr. Scholey and I myself, all formerly shared this view. Yet at the present time, all of us are agreed that in every case where it has been possible to observe accurately and closely the cuckoo has laid her egg directly into the nest.

In many cases there is little doubt that when the cuckoo has been seen on the ground apparently picking up an egg, she has in reality been devouring an egg taken from the fosterer's nest. I do not know and have never heard of a case when it has been proved conclusively that the cuckoo's egg was first laid on the ground and afterwards introduced into the nest by the bill. On the other hand she has been photographed and even filmed in the act of laying, not only in the nests on the ground, but even in that of the Reed-Warbler, which would seem at first sight to be too small for the cuckoo to lay directly into it.

The fact is that the cuckoo can cling to the side of a nest just as a woodpecker clings to the side of a tree, and in that position can bring the cloaca opposite to the entrance of the nest and eject the egg so that it rolls down among those of the foster-parent.

Nests of the Wren frequently bear traces of the damage done to the upper part of the nest while the female is positioning herself for oviposition and several cases are on record where the egg has not rolled into the nest, but has fallen to the ground. This could hardly happen if the egg had been placed in the nest by the parent's bill.

It is not *impossible* that the method which Lt.-Col Burton describes as being adopted in the majority of cases may also be used, but the fact remains that so far we lack conclusive proof of it.

'On rare occasions the mother has been observed to feed its own young: while there is one reported instance of the common cuckoo hatching its own eggs and rearing the young.' (p. 268.)

The evidence of the hen cuckoo feeding her young is quite unconvincing: moreover other species besides the actual fosterers have been known to supply food to a hungry youngster. As for the story of the cuckoo hatching its own eggs, this was published over forty years ago in a popular German paper. It was at once challenged and disproved on internal evidence and has never been accepted in the country of its origin, but was unfortunately translated and republished in England and has been quoted several times since as authentic, although known to all ornithologists as being quite unreliable.

The proportion of eggs which resemble those of the fosterer is extremely high in those districts where the cuckoo is parasitic on one or two species only. In certain districts however where four or five common fosterers are present a 'mixed' type occurs, in which resemblance is less close—I do not find any discrepancy between the views of Mr. Stuart Baker and Dr. Rensch. The adaptation of the cuckoo's eggs spoken of by the former is carried out by elimination of unsuitable eggs by the fosterer, not by any action on the part of the cuckoo.

WHITEKIRK,
SOUTHBORNE, F. C. R. JOURDAIN.
BOURNEMOUTH.
January 1936.

2. Naturalists will be grateful to Col. R. W. Burton for his very interesting collection of Cuckoo-Lore recently published in the *Journal* (vol. xxxviii, p. 266).

Considering the number of parasitic cuckoos in the Indian region it is surprising to see how little has been recorded about them except for the valuable contributions of Mr. Stuart Baker. It shows how real Ornithology has been neglected.

Col. Burton's article provokes interest—and so, of course, comment; and that surely is what it was written for, that naturalists may record their own experiences, and offer their own opinions on the problems that the parasitic cuckoos set us. Until such problems are definitely solved, and proof acceptable to Science established, the humblest naturalist among us is entitled to his opinion—and the interchange of such opinions lightens the way for an impartial summing up of the evidence and the pronouncement of a verdict—if a verdict can indeed ever be given. But as Delight lies all along the way let as many of us as possible join in.

Mention is made on page 267 of small birds chasing cuckoos on account of their resemblance to a bird of prey—presumably the sparrow-hawk. It cannot be denied that small birds take a great interest in cuckoos and get very excited by their presence, but I do not think it is because they appear to them like a bird of prey, for reasons I have given (*vide* p. 734 of this number). It is very significant in this connection to notice that it is those species who are commonly the fosterers of the cuckoo that show the most excited interest in the cuckoo.

I do not think a cuckoo's egg has become reduced to its present small size to enable the cuckoo to carry it easily in her bill. There is as yet no evidence that she ever does so. It is generally believed that she does pick up her egg in her bill on occasions to get it into a nest, but it must not be forgotten that that has not yet been proved that she does so. I think it is due to the necessity of adapting the size of her egg to the eggs of the fosterer she has become parasitic on. As to why she should become parasitic on small birds, that is another question. Small birds are more numerous and may have offered better opportunities, bearing in mind the competition from other species of larger parasitic cuckoos on the larger species.

Not only soft-billed birds that feed on insects, but also birds of the Bunting type are made use of as fosterers. A regular fosterer in Kashmir is the Striated Meadow Bunting, and in India and Burma the Crested Bunting. These species are mostly grain and seed eaters.

Is the instance of a cuckoo rearing its own young beyond all shadow of doubt? I should much like to see the record.

With regard to the remarks on page 269, surely such Hawk Cuckoos have adapted their eggs to the fosterers they are now using. I do not quite follow that paragraph. Cuckoos we may presume laid white or non-descript eggs originally in the long, long ago, and in the case of these Hawk Cuckoos they became gradually blue for adaptation to the eggs of the species chosen by them to act as fosterers which laid blue eggs. It was certainly not a case of blue-egg-laying cuckoos going about looking for blue eggs!

As to the remarks on pages 275 and 276 a good deal has been discovered since then. I myself have taken a number of eggs of the Burmese Plaintive Cuckoo both in the Chin Hills in nests of *Suya atrogularis* (July and August), in the Shan States in nests of Franklin's Wren Warbler (*F. gracilis*) and certain tailor birds (in April, May and June). I have taken photographs of their eggs in the nests and of the young cuckoo being fed by Franklin's Wren Warbler. The adaptation to the eggs of the fosterer is remarkable, and far more perfect than I have ever seen in the case of *canorus* eggs. Here no one could doubt the mimicry or exact resemblance.

As regards the Bay-banded cuckoo (*Penthoceryx sonneratti*) I have found it not rare in the Shan States. In my note on Cuckoos in the *Journal* of December 15, 1933, there is mention of seven eggs found in a variety of nests that I put down to this cuckoo. One of these eggs in the nest of a Shan States Scimitar Babbler has been sent to Mr. Stuart Baker for identification. It is interesting to note that these seven eggs were placed in six different species nests, and that they did not appear to be adapted to anyone of the six, as a matter of fact contrasting violently with all the fosterer's eggs. Two were found in nests of the Shan States Scimitar Babbler—the small red, richly-coloured and marked egg of the cuckoo contrasting violently with the pure white eggs of the babbler which were nearly three times as large! Of course seven eggs are not sufficient on which to form an opinion, but they do suggest that birds of many kinds will incubate anything—for none were deserted—and that fact goes against the Desertion Theory. No greater contrasts could be imagined—both in colour and size.

All seven eggs were much alike. They were marked rather like English Blackcap's eggs, but had the rich, red colouring of eggs of the Yellow-eyed Babbler (marbled and blotched type). I do not know to what species these eggs were adapted to, but the fact of seven being found in seven unsuitable nests suggests that there were none of the chosen fosterer about that locality.

With regard to cuckoos placing not more than one of their eggs in any one nest, I think, that this has only been established in the case of *canorus* and the Plaintive Cuckoo (*C. merulinus*). It does not follow that other parasitic cuckoos show a like restraint. I suspect both the Koels and Crested Cuckoos to place several of their eggs in the same nest. I have seen a pair of crows feeding three young koels sitting on a house top at Kotah, and that suggested to me at the time that a hen koel perhaps placed several of her eggs in one nest, and that the young koels that hatched out did not eliminate each other as in the case of *C. canorus*, etc. Is this so?

Experiments such as are recorded on page 280 tell against the Desertion Theory very strongly—and it has been my experience that birds will incubate anything and very rarely desert on account of a strange egg, or even object, placed in their nest. I have found only about three nests out of a hundred deserted in the case of nests with cuckoo's eggs (*C. c. bakeri*) in them, and in those three instances the reason for desertion was not established. Three per cent of desertions—or more—occur ordinarily in Nature among birds of many species due to accidents, illness, approach of cattle, or humans, etc., etc.

In this locality I have recorded how pale blue, immaculate eggs of *C. c. bakeri* are frequently placed in Stone Chat's nests where the contrast is astounding—yet I have noticed no desertions on that account.

In the above comments I apologise for certain repetitions and redundances. There is a wide and exciting field for exploration among the parasitic cuckoos in India and Burma, and for anyone who intends to enter in I would recommend him to read and study a small book published by Sidgwick & Jackson, 1922, *The Cuckoo's Secret* by Edgar Chance. That book gives a good idea how to set about an intensive study of the cuckoo and how it should be photographed and filmed. He proved in this way one fact among others and that was, that in England, the cuckoo actually sits on the nest of the Meadow Pipit to lay directly into the nest.

TAUNGGYI,
S. SHAN STATES, BURMA. T. R. LIVESEY.
February 11, 1936.

X.—THE BROWN SHRIKE (*LANIUS CRISTATUS* LINN.) IN BURMA AND ASSAM.

Mr. Whistler has practically answered Capt. Livesey's query about the status and plumage of the Brown Shrike (p. 307). I can add that the adult dress must be quite common in Burma as I have received, besides spring examples, five or six in the winter, all showing the black band through the eye and the underparts more or less unbarred. Some are immaculate in this respect and although most adult males show no barring, some females may also be similar. I notice that in females this band is often, but not always, less decidedly black than in males. So far as is known this Shrike does not breed in Burma, and in this connection I can state that it has not completed its full moult until early in May and that it may be commonly met with still in May or perhaps, as Capt. Livesey has noted, to early June. But then this Shrike is a late breeder and the first arrive in Kentei, Mongolia, according to Madam Koslor, on May 24. Hence its lingering on in Burma is nothing remarkable.

There is just one point I should like to query and that is that this Shrike breeds in Assam. Mr. Stuart Baker in his *Nidification of Indian Birds*, vol. ii, quotes his own records of many nests found by himself in the Cachar and Khasia Hills. But it must be noted that he quotes them 'for what they are worth', implying thereby that he is not too certain about them, in spite of the statement that birds snared off the nests are in the Bulgarian Museum. But according to the catalogue of the Royal Museum the only *Lanius cristatus* there from Cachar which might conceivably be said to have been taken in the breeding season is dated June 4, 1894 and there is nothing on the label to show that it was taken from a nest. All the others are dated from September to March. As shown above, a bird early in June might still be on passage in Cachar and beyond this there is no proof whatsoever, except Mr. Baker's recollections of forty years ago, that this Shrike breeds in Assam at all and I think we should wait further proof before accepting the record. After all, Cachar is some 1,600 miles south of the known southern limit of breeding!

Saxon House, Appledore,
Kent, England.
April 15, 1935.

CLAUD B. TICEHURST.

XI.—A NOTE ON THE DISTRIBUTION OF *CHLOROPSIS JERDONI* (BLYTH) AND *CHLOROPSIS A. AURIFRONS* (TEMM.) IN CENTRAL AND WESTERN BENGAL.

It seems the distribution of *Chloropsis jerdoni* (Blyth) and *C. a. aurifrons* (Temm.) in reference to Central and Lower Bengal is obscure. The *Fauna* mentions Midnapur as the easternmost limit of the range of the former, to which Mr. Whistler lends support by saying that it is 'correct' (Vernay Survey, *J.B.N.H.S.*, xxxv, 753). Jerdon writes of it as 'not extending to Lower Bengal'. Ball, however, recorded its distribution in district Burdwan (*S.F.*, vii, 215). Reports of its occurrence in 24-Perganas, Hooghly and Burdwan have from time to time reached me and on August 28, 1932, I collected one specimen ♀ from Khardah (24-Perganas). Apparently a stray or rather lonely bird though it was, there cannot be any question as to its being an 'escape' from the cage, for as a rule, females are not caught and offered for sale in the Calcutta market. I found it in a somewhat jungly waste land in the outskirts of a village: solitary and silent, clinging to low branches of *Dillenia indica* and *Alstonia scholaris* and looking for insects. Measurements: wing 90 mm., tarsus 20 mm., culmen 20 mm.

Of *C. a. aurifrons* (Temm.) the *New Fauna* has no reference to Central and Western Bengal. Blyth and Ball collected it no doubt from Midnapur. I observed it common enough at Jhargram, associating not unoften with *jerdoni* in *Sal* jungles. Jerdon also mentioned it from Midnapur as well as Lower Bengal. Cunningham (*Some Indian Friends and Acquaintances*, 93-4) who saw it in gardens near Calcutta wrote (1903): 'It is certainly seldom noticed, but this by no means implies that it is very rare, as birds of such quiet habit and singularly protective colouring may well fail to attract notice even where they are relatively common.' While one might not doubt the applicability of this remark in past days, the species is now unmistakably one of very very rare occurrence in Lower Bengal, specially in the immediate environs of Calcutta. Whatever stray specimens are now and then observed amidst remote villages may very well have been escapes from the cage (astonishingly huge trade in these birds goes on in the Calcutta market!), now at liberty, striving to hold their own against odds and adverse circumstances. They are invariably found to be shy and wandering locally. One such pair I have myself come across several times in the outskirts of village Bandipur, off Khardah (24-Perganas).

Calcutta.
March 4, 1936.

SATYA CHURN LAW,
M.A., Ph.D., F.Z.S., M.B.O.U.

XII.—INDUS SAND LARK (*ALAUDULA RAYTAL ADAMSI* HUME) AND CRESTED LARK (*GALERIDA CRISTATA* LINN.) LAYING IN THE SAME NEST.

Can you or any of your readers let me know if the following has ever been noticed before and if it is a regular thing?

On the 20th of this month I observed a lark's nest containing one egg and to all intents and purposes the nest was that of an Indus Sand Lark (*Alaudula adamsi*). In fact this lark was seen to rise from the locality and it was this which led to my finding the nest. The egg however appeared to be rather too large for a lark of this species; but as there was only one egg, and not wanting the bird to desert it, I did not examine it closely. I again went and examined the nest on the 23rd to obtain the full clutch and was surprised to find not two eggs but no less than five, three belonging to the Crested Lark and two to the Indus Sand Lark. The bird that flew off the nest on the second occasion was a Crested Lark (*Galerida cristata*). Now the point is, whom did the nest belong to? The size of the nest indicates that it belonged to the Indus Sand Lark as it is much smaller than that of the Crested Lark and the same size as other nests of the former in my possession. As the nest contained a full clutch of each of the birds, it shows that the nest was being shared by them and probably both helping in the matter of incubation.

GENERAL POST OFFICE, H. M. S. NEWTON.
KARACHI. *Postmaster.*
March 23, 1936.

[There are instances in which an unusual number of eggs found in a nest is the product of more than one parent of the same species. There are again instances of birds laying their eggs in the disused nests of other species, not only habitual parasites such as the cuckoos, but species which customarily build nests for themselves. The appropriation of the nest of other species occurs quite commonly among certain birds, which build nests of their own. White-throated Munias may for example not only build their nests in the base of an eagle's nest or in the nest of a Scavenger Vulture, but they frequently appropriate the disused nests of Weaver birds. Marshall even found a sparrow's nest occupied by a pair of munias. The nest contained four sparrow's eggs and seven eggs of the munias. So far as we are aware no such instances have been recorded of larks. Indus Sand Larks, from the experience of Col. A. E. Butler, and Mr. R. C. Pitman, sometimes build a nest very similar to the nest of the Crested Lark and in the present case the Crested Lark may have appropriated the nest of the former. The writer of the note had the opportunity of discovering whether the fortuitous partnership between the two species extended to the incubation of the eggs or even the care of the young.—EDS.]

XIII.—THE BROWN WOOD OWL (*STRIX INDRANEE* SYKES).

(*With a photo*).

I see the note of this fine owl is queried in vol. xxxviii, No. 2, p. 233.

A pair of these owls which I secured at Sintaung, 12 miles south of Taunggyi, S. Shan States, in 1933 were kept in captivity by me for some time, and subsequently by Mr. Carrot at Maymyo for nearly two years. They have been described as a new subspecies by Mr. Stuart Baker, *Strix indranee shanensis*, in Bulletin No. cccxc of the *B.O.U.* of November 13, 1935.

The Brown Wood Owl
Young male bird.

I have good reason to remember the diabolical, screaming shrieks both birds (an old hen bird and a young male bird) used to utter during the night, for they were in a cage just by my bedside! They are most certainly 'Devil birds' of a kind—and their scream like the high-pitched shriek of some demented person casting themselves over a precipice! Besides this diabolical screaming they have a respectable, and lovely-sounding, rolling hoot which reminds me of the hooting of the Tawny Owl in England but, I think, it is more musical and prolonged.

The Taungyos and Taungthus name this owl from its hooting. The former call it 'Tit-ter-roo' and the latter 'Tit-til-loo'.

I had to keep them in captivity as the old female had her wing broken by a blow from a stick as she flapped out of a cave and the young bird when captured was not fully fledged and could not fly.

It is interesting to record that the eyes of the young owl were seriously injured—temporarily—by my placing it in the sunlight to photograph it. Two or three days after the photograph was taken the eyes turned dull red, and this bird could not see. It appeared to me that the diaphragms of the iris had opened right out, and that the back of the retina, highly inflamed, was therefore fully visible and so gave the eyes their red appearance.

It did not recover its sight for about a fortnight—the iris gradually relaxing from day to day. I have heard these owls hoot from the crags at Taunggyi. Here they apparently breed in February and March, I am told, in rocky caves. I have not heard of them under 4,000 ft.

TAUNGGYI,
S. SHAN STATES, BURMA. T. R. LIVESEY.
March 4, 1936.

XIV.—THE WHITE-BELLIED SEA-EAGLE (*HALIAEETUS LEUCOGASTER* GMELIN) IN NORTH GUJARAT.

Does the *Haliaëtus leucogaster* frequent inland lakes?

On the 9th of February 1936, I visited Gobhlaj—one of the largest artificial lakes of North Gujarat, nearly eight miles in circumference, eighteen miles south of Ahmedabad and a favourite haunt of migratory birds to pass the winter. There I saw a bird, bigger than a kite—to quote from the notes I made on the spot—'perched on a vertical post in water; its wings ashy black, top of head, neck, lower parts and legs snowy-white, beak black.' Clearly a White-Bellied Sea-Eagle.

It was not possible to see the colour of its back as the bird sat facing me at a distance of about a hundred feet. Thus I had ample opportunity to observe it with naked eye as well as with a pair of powerful binoculars. Hence there was very little chance of any mistake.

But experts say that this species of Eagle is not seen inland. It is also not recorded in the works of Butler and Barnes as occurring in Gujarat. Eha also is of opinion that it does not go inland owing to the absence of its food, viz., sea-snakes, though Stuart Baker (*Fauna of British India*, 2nd ed.) gives 'fish' as its normal food. The nearest seacoast is 50 miles from this place.

Was I mistaken? Or was the bird a straggler?

AHMEDABAD,
N. GUJERAT. HARI NARAYAN G. ACHARYA,
March 3, 1936. F.Z.S., F.R.G.S.

XV.—THE EYESIGHT OF VULTURES.

As soon as the early morning sun has taken effect vultures leave their perch and with a flapping flight of some fifteen seconds' duration, in order to get clearance, they begin to soar in circles: making height at every turn. Between five and six minutes' time they pass out of vision to the naked eye, but can be followed to greater heights with a glass until they again disappear. During the day the whole of India from Bombay to Calcutta is under observation by vultures and every vulture is in sight of one, or more, other vultures. When an animal has been killed the first bird to arrive is the crow. This is shortly followed by the kite. The vulture within whose orbit this takes place descends to inspect, and if the kill is worthy of his attention he makes a second descent to earth. His preliminary descent has been observed by some five or six vultures from their orbits. These converge on the vacant orbit, still keeping their altitude, and on arriving over the kill, and thus able to inspect, they, in their turn descend. The movements of each of these five or six vultures has been observed by five or six more vultures from their orbits, and the same procedure is adopted until the sky over a wide area has been drained of its vultures.

IVYBANK, BISHOPMILL,
ELGIN, N.B.
April 10, 1936.

A. A. DUNBAR BRANDER.

XVI.—A NOTE ON THE ALPINE SWIFTS (*MICROPUS MELBA BAKERI* HARTERT) AT GERSOPPA.

In a recent issue of the *Journal,* Mr. Hugh Whistler summarised our knowledge of this bird. As a considerable amount of speculation and uncertainty seems to be attached both to the records and their interpretation, I venture to place on record a few notes that I was recently able to make.

Motoring in from a camp in Dharwar, we reached the British side of the Falls at 11 a.m. on Christmas morning. The 800 ft. valley was full of Alpine swifts. They were as thick as a swarm of midges, and in this place of huge distances they looked hardly any bigger. A few flew higher and passed leisurely within a few feet of us as we stood at the top.

The ledge that overlooks the 'Rajah' is an excellent place for observation. Birds flew in and out of the innumerable cracks near the top of the cliff between the 'Rajah' and the 'Roarer'. The broader ledges are occupied by pigeons, which look like grey flies in the distance. As these birds fly about they dislodge pieces of the dry stunted grass that grows among the rocks. The swifts can then be seen chasing the straw as it floats slowly down, and having captured it carry it into crevices in the rock.

By 3 p.m. the number of birds had dwindled appreciably, but they were in all probability resting in the rocks. At dusk they had regained their numbers, and now they flew higher and even strayed some distance from the falls. Large flocks flew round twittering the while. The movement was not unlike the oft-described 'balling' of *Micropus affinis*, but was less compact. Long after dark, in fact I noted it till 10 p.m., an occasional twitter could be heard far above. Are stray birds still aloft, or is it some sort of bat?

Davidson (Birds of North Kanara, *J.B.N.H.S.*, xi & xii) believed that they collected here from the surrounding country to roost, and states that the birds 'pour in long after dark'. While visibility lasted (there was no moon), I noticed no movements that could be interpreted as a daily mass migration.

On the morning of the 26th we went down to the pool at the bottom, and collected a pair of swifts as they swept past us in the valley. Many birds appeared to have paired off, and some sort of aerial courting was going on. Alpine swifts in pairs were also seen elsewhere in Dharwar and Belgaum during the week.

The specimens collected, were submitted to Mr. Whistler who has named them as *bakeri*, and measures them as follows:—

♂ bill 15·5; wing 204; tail 75 mm.
♀ bill 15·5; wing 200; tail 76 mm.

The male, with fairly large salivary glands had testes measuring 18 × 8 mm. The female with a shelled egg in the oviduct, had the salivary glands very much more enlarged. The egg, broken by the shot, was roughly measured as 24 mm. long, which approximates to the egg obtained by Miss Cockburn, and upon which doubt has been cast. Another follicle was enlarged to a sphere of 13 mm. Two more of the ova measured 4 mm. each. The oviduct was much distended and may have been used. Both birds were very fat. The contents of the stomachs were few and unrecognizable.

There were few other birds about—the rock scarp being bare and uninviting. Pigeons, of course, were fairly numerous, and nested on the broader ledges. A honey-buzzard hung about the place, and the swifts flew excitedly round it. An unidentified hawk, in spite of being mobbed by the pigeons dropped on to a ledge and calmly flew away with a squab. On the cliff opposite the falls, white patches advertised the nests of a few pairs of *Gyps indicus*. A small number of *Krimnochelidon concolor*, *Hirundo fluvicola* (?), and a solitary *Halcyon pileata* completes the list.

This last bird was a surprise. I had always believed that it was a littoral species. The stream flows into the sea 20 miles away, and the bird probably found its way upstream. It is of interest to note that Davidson saw it in the same place many years ago.

BOMBAY. HUMAYUN ABDULALI.
March 15, 1936.

XVII.—DOES THE JAPANESE GREY QUAIL (*COTURNIX C. JAPONICA* TEMM. & SCHLEG.) BREED IN THE SHAN STATES?

Last year when ploughing in wheat seed on fallow land by my house at Taunggyi, S. Shan States, Burma, at an elevation of approximately 5,000 ft. a carefully made Quail's nest was upset, and three out of seven of the eggs destroyed. The remaining four eggs are of the Grey Quail type spotted and well marked and measured as follows:—

29.0 × 23.0 mm.; 28.0 × 22.0 mm.;
29.0 × 22.0 mm.; 29.3 × 22.5 mm.

These measurements partly exceed the maximum width measurements given in *Nidification* for *C. c. coromandelica* and would suggest that they are eggs of the Japanese Grey Quail (*C. c. japonica*) which is not known to breed in Burma.

The nest was found on October 30, 1935, and, of course, at that time of the year the Japanese Grey Quail are with us here in the Shan States—and a casual clutch of eggs would not be too surprising. Mr. Stuart Baker saw one of the eggs and considered it to be an egg of *C. c. coromandelica* but he did not remark on its large size for that species.

I myself believe the eggs to be those of *C. c. japonica*, but the identification cannot be considered as established!

TAUNGGYI,
S. SHAN STATES, BURMA. T. R. LIVESEY.
November 5, 1935.

XVIII.—SARUS FLOCKS.

It is a well known habit of the Sarus Crane (*A. antigone*) to generally move in pairs. Taking their stand on this fact, many ornithologists aver that these birds never occur in flocks. Even that wonderful observer Devar subscribes to this opinion in his *Common Birds* (vol. ii, p. 40), though, very shrewdly, with some reservation.

This may be true for other parts of India but clearly is not correct for North Gujarāt. For here, one comes across numerous flocks of this beautiful bird—sometimes peacefully resting or passing the night in an open field or on the banks of the river Sabarmati, occasionally feeding on Gram (*Cicer arietinum*) crops or sonorously flying overhead—their number varying from 20 to 200.

This flocking habit of the Sarus is peculiar for this part of the country, as it has been even observed by writers, two or three centuries back, in Samskrta literature.

AHMEDABAD, HARI NARAYAN G. ACHARYA,
N. GUJARAT. F.Z.S., F.R.G.S.
March 3, 1936.

XIX.—THE LONG-TAILED DUCK (*CLANGULA HYEMALIS* LINN.) IN SIND.

A female of the Long-tailed Duck (*Clangula hyemalis*) was shot by Mr. Lambrick at Drig, Sind, and sent to the Society for identification. This is the third record of the occurrence of this duck within Indian limits within the last few years.

The first record was of a specimen shot at Chaman, Baluchistan, in October 1933 by Capt. A. E. Dredge (Stuart Baker, *J.B.N.H.S.*, vol. xxxvii, p. 549). The second record was made by Mr. R. E. Parsons. This specimen was shot at the village of Messaki, on the Brahmaputra River in the Passighat Division, Sadya Frontier, Assam.

Bombay Natural History Society,
6, Apollo Street, Bombay.
March 15, 1936.

S. H. PRATER.

XX.—DEATH OF SURVEY KHALASSI DUE TO POISONING BY A COMMON KRAIT (*BUNGARUS CAERULEUS*).

Capt. H. W. Wright, R.E., has sent the following report on the death of a Survey Khalassi from Krait poisoning. The snake responsible for the fatality was submitted for identification by the Director, Geodesic Branch Survey of India. It has been identified as a Common Krait (*Bungarus caeruleus*).

'Khalassi Nandan Singh who was working in Surveyor Kundan Singh's squad died on 20th November 1935 morning at Chaman village (Jaisalmer) in map sheet 45A.

He was sleeping on the ground when at about 2-30 a.m. he found something crawling over his legs. He woke up other khalassis in the tent who found nearby a black snake with white rings, being 1 in. in girth and 1½ ft. long, which they killed.

After an hour, Nandan Singh complained of a burning sensation in his mouth at which the Surveyor thought that the snake had bitten him. But no mark of the bite was found anywhere and neither did the deceased complain of any burning sensation over any other part of his body.

The surveyor then called the villagers to find out whether they could cure him with country-medicines, but they told him that such a snake's poison was incurable.

Within half an hour the victim died.

On receipt of the information, a Survey Officer, who was camping about four miles way from Chaman, went to look at the deceased after about six hours, by which time the body had become cold and stiff. The Officer could not discover any snake-bite mark on the body.

The local people say that it is a very poisonous snake which never bites and which after inhaling the breath that comes out through the mouth of persons who sleep with mouths open at night drops some of its poison into that person's mouth; result being instantaneous death without any remedy. Other villagers also confirm this story with many similar instances of death.'[1]

EDITORS.

---

[1] That Kraits and Phoorsas poison people when asleep in the ingenious manner described above or even by merely breathing upon them is a belief prevalent in many parts of India. It is a belief akin to that of the Mythical 'Bis-Cobra' which is supposed to kill a man by casting its shadow over him!—Eds.

XXI. MIGRATION OF WILDFOWL.

(*Continued from Volume XXXVIII, p. 627*)

Since the publication of the last list of recoveries of ringed Birds the following recoveries have been reported to us.

Place of Ringing	No.	Date	Species	Ringed by	Date of recovery	Locality	Remarks
Manchar Lake, Larkana District, Sind.	3373	23—1—29	Widgeon, ♀ (*Mareca penelope*).	R. B. Maclachlan.	Beginning of April 1929.	6 Kilometers from Kara-Uzen, Tashkent Rly.	
Do.	3354	23—1—29	Gadwal, ♀ *C. streperus*.	Do.	9—VIII—31	Region of Ustynissk near village of Kotchardyssk, 54°25′N—60°E.	

EDITORS.

XXII.—OCCURRENCE OF SHRENK'S BITTERN (*IXOBRYCHUS EURYTHMUS*, SWINHOE) IN AMHERST DISTRICT, TENASSERIM.

While trying to find snipe in the heavily-flooded area near Yedwingon on the Moulmein-Kyaikmaraw road on 24th September 1935 I shot an unknown *byaing* which none of the local villagers had ever seen before.

On examination by Dr. Ticehurst, M.B.O.U., this has been identified as Shrenk's Bittern (*Ixobrychus eurythmus*) a bird which has apparently never previously been recorded within Indian limits and I have been unable to trace any Yunnan records. On the following day the same party secured a second specimen which the local coolies regrettably plucked, no others were seen.

RANGOON. C. E. MILNER,
April 4, 1936. I.F.S.

[Shrenk's Bittern is a new addition to the *Indian Avifauna.* The recorded distribution of the species is Eastern China extending into Japan. A few descend into Indo-China.—EDS.]

XXIII.—OCCURRENCE OF THE BUTTERFLY (*P. ANTIPHATES NAIRA*) IN THE NILGIRIS.

With reference to the last para of Mr. J. A. Yates' article on Butterflies of the Nilgiri District published in Part II, vol. xxxviii, of the *Journal*, I have two specimens of *P. antiphates naira* which I took on the Nadghani Ghat Road on the western slope of the Nilgiris at an elevation of about 1,500 ft. on 23rd April 1921. This is the only occasion I ever saw one.

STONE HOUSE, PEWSEY, T. DELVES BROUGHTON,
WILTS, ENGLAND. *Brigadier*, R.E. (retd.).
January 27, 1936.

XXIV.—DISTRIBUTION OF THE BUPRESTID BEETLE (*STERNOCERA CHRYSIS* F.).

Reference: *Journal of the Bombay Natural History Society*, vol. xxxviii, p. 411, *Sternocera chrysis.*

According to Obenberger's *Coleopterorum Catalogus, Buprestidae*, 1926, *Sternocera chrysis* F. is known from Ceylon, India, Baluchistan, Himalayas, Burma, Siam and South China.

I have observed beetles of the form *chrysidoides* feeding on the foliage of *Acacia arabica* and *A. leucophloea*. From its distribution and the habits of its allies it is probable that *S. chrysis* is associated with Acacias and breeds in stumps and roots of these trees in the larval stage.

NEW FOREST,
DEHRA DUN.
February 12, 1936.

C. F. C. BEESON,
D.SC., F.R.E.S., F.N.I.S.,
Forest Entomologist.

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